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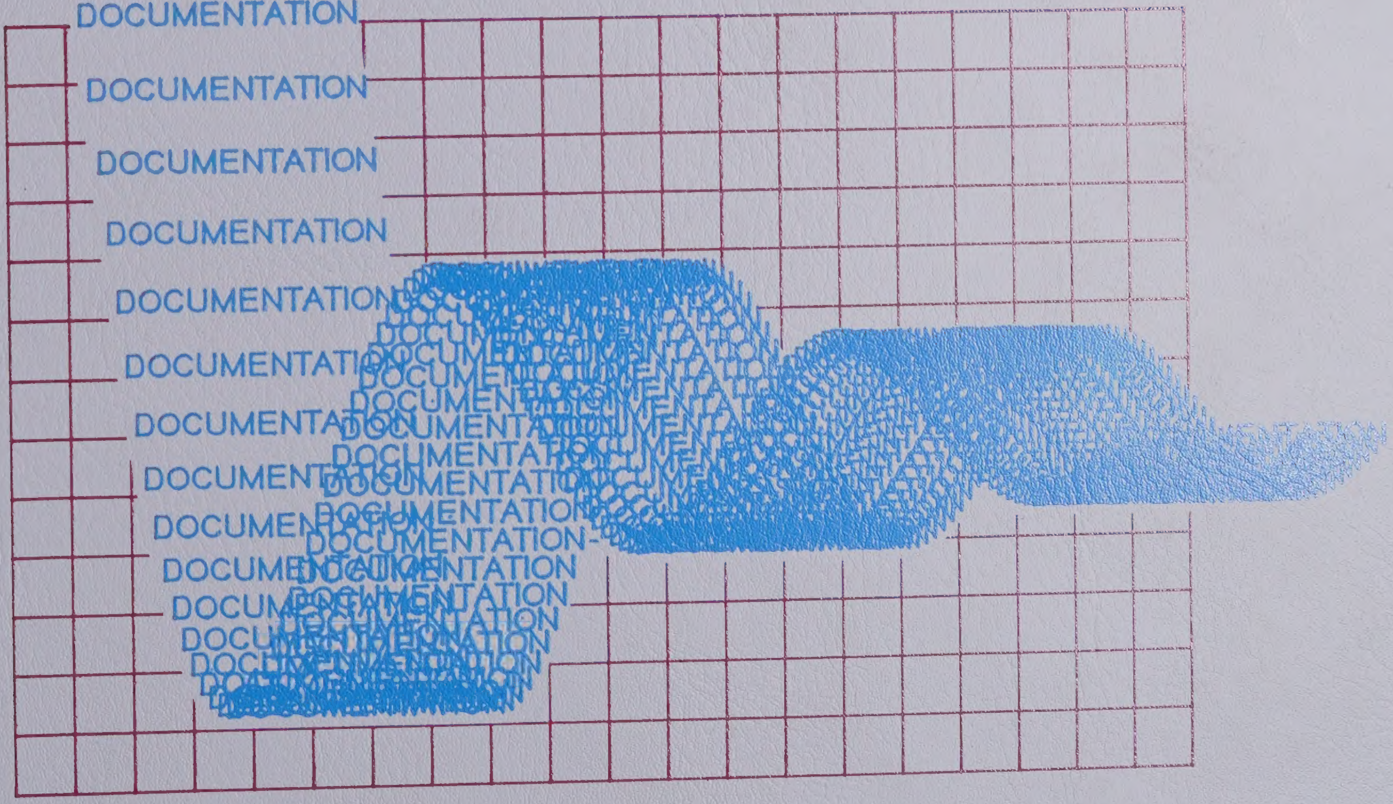

ROHDE&SCHWARZ

Test and Measurement
Division

Operating Manual

Software Options:

CDMA2000
for R&S® CMU-B83

R&S® CMU-K83/-K84/-K85/-K86

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Dear Customer,

throughout this manual, CMU-K83/-K84/-K85/-K86 is generally used as an abbreviation for software options R&S CMU-K83/-K84/-K85/-K86. The Universal Radio Communication Tester R&S CMU 200 is abbreviated as CMU200.

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List of R&S Representatives

Manuals for Universal Radio Communication Tester CMU
What's New in this Revision?
Abbreviations
Glossary

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Contents of Manuals for Universal Radio Communication Tester CMU

The user documentation for the R&S CMU 200/300 is divided in an operating manual for the basic instrument (including options CMU-B41, CMU-B17) and separate manuals for individual software and hardware options. The complete documentation is available on CD-ROM, stock no. PD 0757.7746.2x. The latest revisions of all manuals are also posted on the CMU Customer Web on GLORIS.

Operating Manual CMU-K83/-K84/-K85/-K86 (Software Options for CMU-B81)

The present operating manual describes the application of CMU for CDMA2000 mobile tests. It gives comprehensive information about the operating concept and about manual and remote control of the CMU tester. Typical measurement tasks are explained in detail using the functions offered by the graphical user interface and a selection of program examples.

The manual is organized as follows:

Chapter 1	Describes the steps necessary for installing the software and putting the instrument into operation.
Chapter 2	Gives an introduction to the application of CMU for CDMA2000 mobile tests and presents some typical measurement examples.
Chapter 3	Describes the operation in principle and the principles of measurement control.
Chapter 4	Serves as a reference of all functions of the user interface and their application. Allowed settings, default values and the corresponding remote control commands are listed for all functions.
Chapter 5	Describes the basics of remote control of the instrument for CDMA2000 mobile tests.
Chapter 6	Lists all remote control commands defined for CDMA2000 mobile tests. At the end of the chapter the commands are grouped together according to their function and sorted by alphabetical order.
Chapter 7	Contains program examples.
Chapter 8	Describes preventive maintenance.
Chapter 9	Contains a list of error codes
Chapter 10	Contains an index for the operating manual.

Operating Manual CMU200/CMU300

In the operating manual for CMU basic unit you will find everything that is needed to make yourself familiar with your Universal Radio Communication Tester CMU200. This includes information about the technical specifications of the CMU, the controls and connectors on the front and rear panel, necessary steps for putting the instrument into operation, the basic operating concept, manual and remote control. Typical measurement tasks are explained in detail using the functions of the user interface and program examples. In addition, the operating manual lists the most important warnings and error messages which may be output by the instrument.

General concepts of CMU control are described in the operating manual CMU200 and not repeated in the manuals for the individual software options.

Service Manual Instrument

The service manual instrument informs on how to check compliance with rated specifications, on instrument function, repair, troubleshooting and fault elimination. It contains all information required for the maintenance of CMU by exchanging modules.

Service Manual Modules

The service manual modules is not delivered with the instrument but may be obtained from your R&S service department using the order number 1100.4903.91.

Service manual modules contains information about the individual modules of CMU. This comprises the test and adjustment of the modules, fault detection within the modules and the interface description.

Further Operating Manuals for Network Tests

The operating manuals listed in the following table describe the test of radio communication equipment supporting different standards by means of the CMU and the appropriate software and hardware options. The network test operating manuals are organized like the present CDMA2000 operating manual.

Manual	Order Number	For Options Type	Description	Stock No.
Operating Manual CMU-K20/-K21/-K22/-K23/-K24	1115.6088.12	CMU-K20 CMU-K21 CMU-K22 CMU-K23 CMU-K24	GSM400-MS for CMU-B21 GSM900-MS for CMU-B21 GSM1800-MS for CMU-B21 GSM1900-MS for CMU-B21 GSM850-MS for CMU-B21	1115.5900.02 1115.6007.02 1115.6107.02 1115.6207.02 1115.6307.02
		CMU-K42 CMU-K43 CMU-K45	GPRS software extension for GSM EGPRS software extension for GSM AMR GSM for CMU200	1115.4691.02 1115.6907.02 1150.3100.02
Operating Manual CMU-K27/-K28	1115.6688.12	CMU-K27 CMU-K28	TDMA800-MS for CMU-B21 TDMA1900-MS for CMU-B21	1115.6607.02 1115.6707.02
Operating Manual CMU-K29	1115.6888.12	CMU-K29	AMPS-MS for CMU-B21	1115.6807.02
Operating Manual CMU-K30/-K31/-K32/-K33/-K34	1115.4185.12	CMU-K30 CMU-K31 CMU-K32 CMU-K33 CMU-K34	GSM400-BS for CMU-B21 GSM900-BS for CMU-B21 GSM1800-BS for CMU-B21 GSM1900-BS for CMU-B21 GSM850-BS for CMU-B21	1115.4004.02 1115.4104.02 1115.4204.02 1115.4304.02 1115.4404.02
		CMU-K39 CMU-K41	MOC/MTC EDGE for CMU-K30/31/32/33	1115.4791.02 1115.4604.02
Operating Manual CMU-K53	1115.5081.12	CMU-K53	Bluetooth for CMU	1115.5000.02
Operating Manual CMU-K65/.../-K69	1115.4962.12	CMU-K65 CMU-K66 CMU-K67 CMU-K68 CMU-K69	WCDMA UE TX Test (3GPP/FDD) WCDMA UE DL Generator (3GPP/FDD) WCDMA UE Band III Signalling WCDMA UE Band I Signalling WCDMA UE Band II Signalling	1115.4891.02 1115.5100.02 1150.3000.02 1115.5300.02 1115.5400.02
Operating Manual CMU-K75/-K76	1150.3398.12	CMU-K75 CMU-K76	WCDMA Node B TX Tests WCDMA Generator (3GPP/FDD, Release 99, Uplink)	1150.3200.02 1150.3300.02
Operating Manual CMU-K81/-K82	1115.5581.12	CMU-K81 CMU-K82	CDMA800-MS (IS95) for CMU-B81 CDMA1900-MS (IS95) for CMU-B81	1115.5500.02 1115.5600.02

The GSM base station tests described in operating manual CMU-K30/-K31/-K32/-K33/-K34 and the WCDMA Node B tests described in operating manual CMU-K75/-K76 require a CMU300 (Universal Radio Communication Tester for BTS). Bluetooth tests can be performed with model CMU200, var. 02 or 53. All other radio communication equipment is tested with model CMU200, var.02.

What's new in this Revision...

This operating manual describes version V3.40 of the CDMA2000 firmware package. Compared to previous versions, this new firmware provides numerous extensions and improvements. The new features described in this manual are listed below.

New Features	**Description**	**Refer to...**
NPower	Narrow-band power measurement with a CDMA2000 receiver filter in Non Signalling and Signalling mode.	Chapter 4, CDMA Module Tests (Non Signallig) CDMA Mobile Tests (Signallig) → Power Measurements
Spectrum – ACP	Adjacent channel power measurement at up to four pairs of selectable offset frequencies.	Chapter 4, CDMA Mobile Tests (Signallig) → Spectrum Measurements
Extended trigger functionality	New *RF Power* and *IF Power* trigger.	Chapter 4, CDMA Module Tests (Non Signallig) CDMA Mobile Tests (Signallig) → Connection Control – Trigger
Turbo Coding	Selectable channel coding scheme (convolutional coding or turbo coding) for test data and packet data services.	Chapter 4, CDMA Mobile Tests (Signallig) → Connection Control – Service Cfg.
PCB Step Size	Step sizes of 0.25 dB, 0.5 dB and 1.0 dB for power control available.	Chapter 4, CDMA Mobile Tests (Signallig) → Connection Control – BS Signal.

Frequently Used Abbreviations

3GPP2	3rd Generation Partnership Project 2
Abs.	Absolute
Avg.	Average
AWGN	Additive White Gaussian Noise
CDMA	Code Division Multiple Access
CDP	Code Domain Power
Chan.	Channel
Channel.	Channelization
CRC	Cyclic Redundancy Code
Curr.	Current
Disp.	Display
EIRP	Effective Isotropic Radiated Power
Err.	Error
ESN	Electronic Serial Number
EVM	Error Vector Magnitude
Ext., Extern.	External
FER	Frame Error Rate
FFT	Fast Fourier Transform
Freq.	Frequency
GPIB	General Purpose Interface Bus = IEEE488 Bus
I	In-phase
IF	Intermediate Frequency
Int.	Internal
Lev.	Level
Magn.	Magnitude
Max.	Maximum (e.g. Level)
ME	Magnitude Error
Meas.	Measurement
Min.	Minimum
OCNS	Orthogonal Channel Noise Simulator
OVSF	Orthogonal Variable Spreading Factor
Ovw	Overview
PCS	Personal Communications Services
PCDE	Peak Code Domain Error
PE	Phase Error
Pk.	Peak
Q	Quadrature-phase
QPSK	Quadrature Phase Shift Keying
RBW	Resolution Bandwidth
Ref.	Reference
Rel.	Relative
RF	Radio Frequency
RMS	Root Mean Square
RX	Receiver
Scr.	Scrambling
SW	Software
Sym.	Symbol
Sync.	Synchronous
Synch.	Synchronization
Trg.	Trigger
TX	Transmitter
Vect.	Vector

Glossary of Terms

The following list contains definitions of terms that are often used throughout this manual.

Access Channel	A reverse communication channel used by a mobile station to communicate to a base station.
Carrier Feedthrough	Ratio of the I/Q offset vector (i.e. the estimated DC offset of the measured signal) to the average offset-corrected signal vector.
Carrier frequency error	Deviation of the mobile's modulated carrier frequency from the frequency received from the base station.
Chip rate	Product of the symbol rate and the spreading factor. For the 3GPP2 CDMA2000 1X system a fixed chip rate of 1.2288 Mcps is specified.
Code domain	The entire set of channelization codes involved in a CDMA2000 signal configuration. Measuring a parameter in code domain means to determine its values as a function of the individual channelization codes.
Code domain error	Ratio of the RMS-averaged power of the error vector projected onto the code domain to the RMS-averaged power of the composite reference signal, expressed in dB.
Code domain power	Power in the individual code channels normalized to the power of the composite signal, expressed in dB.
Crest factor	Peak to average ratio: ratio of the peak transmit power in a slot (peak envelope power) to the average transmit power in a slot.
Cyclic Redundancy Code (CRC)	A class of linear error detecting codes which generate parity check bits by finding the remainder of a polynomial division.
E_b	Average energy per information bit for the Sync Channel, Paging Channel, or Forward Traffic Channel at the mobile station antenna connector.
E_b/N_t	The ratio of the combined received energy per bit to the effective noise power spectral density for the Sync Channel, Paging Channel, or Forward Traffic Channel at the mobile station antenna connector.
Error vector magnitude	Difference vector connecting the measured and the ideal modulated signal vector. The error vector magnitude (EVM) is the critical quantity to assess the modulation accuracy of the mobile's transmitter.
I/Q imbalance	Difference between the estimated I and Q amplitudes of the measured signal, normalized and expressed in dB units.
Magnitude error	Difference in magnitude between the measured and the ideal modulated signal vector, normalized to the magnitude of the ideal vector.
Maximum power	Operating mode where the mobile is set to its maximum power control level.
Minimum power	Operating mode where the mobile is set to its minimum power control level.
Modulation accuracy	Ability of the mobile's transmitter to generate an ideally modulated signal.
N_t	The effective noise power spectral density at the mobile station antenna connector.
Paging channel	A forward communication channel used by a base station to communication to a mobile station when it is not assigned to a traffic channel.
Peak code domain error	Maximum of the *code domain errors* for all codes in the domain, expressed in dB.
Phase error	Difference in phase between the measured and the ideal modulated signal

	vector.
Power control bit	A bit sent in every 1.25 ms interval on the Forward Traffic Channel to signal the mobile station to increase or decrease its transmit power.
Power control group	A 1.25 ms interval on the Forward Traffic Channel and the Reverse Traffic Channel. See also Power Control Bit.
Waveform quality	Normalized correlated power between the actual and the ideal waveform, sampled at the constellation points. The waveform quality (ρ factor) is a measure of the modulation accuracy. For an ideal transmitter (ideal correlation), it is equal to 1, otherwise it is a positive number smaller than 1.

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1 Introduction

This chapter describes the installation and update of software options for the Universal Radio Communication Tester R&S CMU 200.

Table 1-1 lists the CDMA2000 networks supported when the hardware and software options are installed to support CDMA2000 functionality.

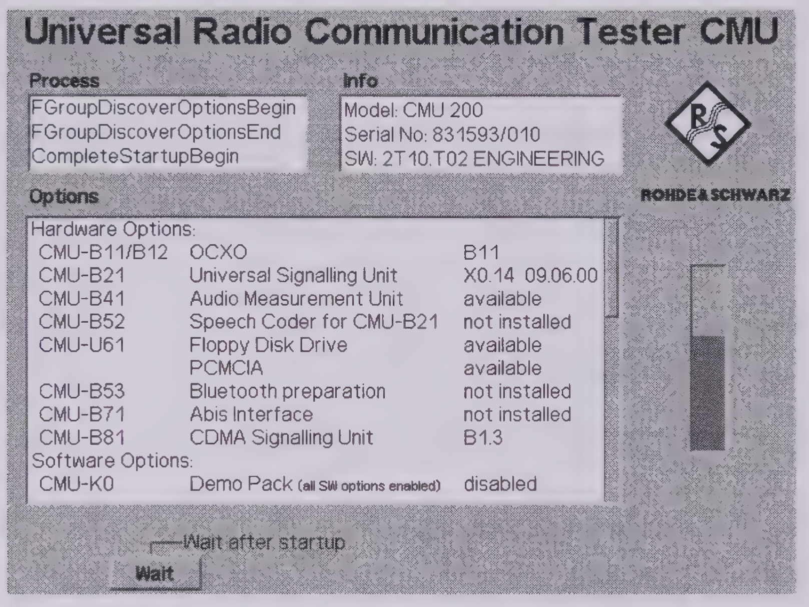
Table 1-1 CDMA networks supported

CMU Options for CDMA	Band Class	Network
CMU-K83 450 MHz	Band Class 5	NMT-450
CMU-K84 Cellular	Band Class 0	US and Korean Cellular
	Band Class 2	TACS
	Band Class 3	JTACS
	Band Class 7	North American 700 MHz
	Band Class 9	900 MHz
	Band Class 10	Secondary 800 MHz
CMU-K85 PCS	Band Class 1	North American PCS
	Band Class 4	Korean PCS
	Band Class 8	1800 MHz
CMU-K86 IMT-2000	Band Class 6	IMT-2000

Installation Instructions

Before performing any of the steps described in this manual, please make sure that the instrument is properly connected and put into operation according to the instructions given in chapter 1 of the CMU Operating manual. The hardware and software options available are shown in the *Startup* menu. The Hardware Option entry "CMU-B83" indicates the status of the hardware option required for CDMA2000 (Code Division Multiple Access) mobile tests. The Software Options entry CMU-K83, CMU-K84, CMU-K85, and/or CMU-K86 indicates the status of the software option required for CDMA2000 mobile tests.

- If version number is indicated, the CMU is ready to perform CDMA2000 mobile tests. In this case you may skip this chapter, except if you wish to update the current software version.
- If `disabled` is indicated, the software option must be enabled using a key code; see section *Creating a new Software Configuration* on page 1.5.
- If `not installed` is indicated, the software must be installed via the PCMCIA interface or the floppy disk drive.



Universal Radio Communication Tester CMU

Process

FGroupDiscoverOptionsBegin
FGroupDiscoverOptionsEnd
CompleteStartupBegin

Info

Model: CMU 200
Serial No: 831593/010
SW: 2T10.T02 ENGINEERING

Options

Hardware Options:		
CMU-B11/B12	OCXO	B11
CMU-B21	Universal Signalling Unit	X0.14 09.06.00
CMU-B41	Audio Measurement Unit	available
CMU-B52	Speech Coder for CMU-B21	not installed
CMU-U61	Floppy Disk Drive	available
	PCMCIA	available
CMU-B53	Bluetooth preparation	not installed
CMU-B71	Abis Interface	not installed
CMU-B81	CDMA Signalling Unit	B1.3
Software Options:		
CMU-K0	Demo Pack (all SW options enabled)	disabled

Figure 1-1 Setup – Options menu

Software Installation or Update

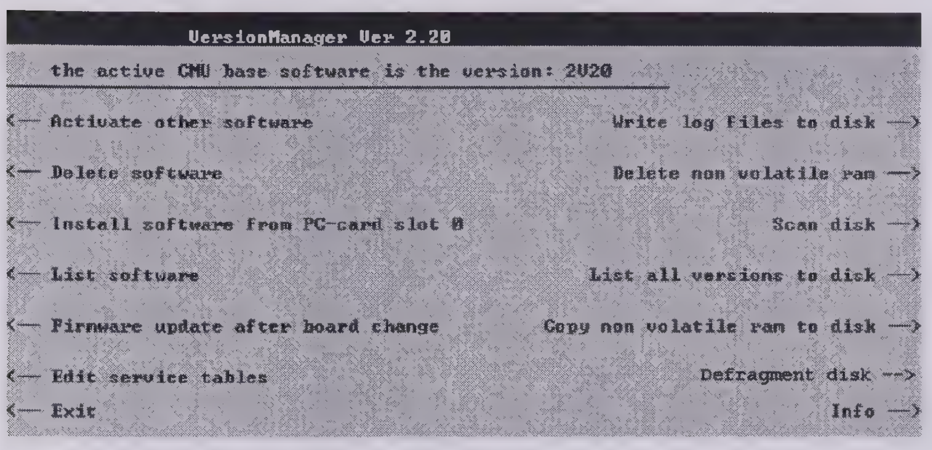
The CMU is always delivered with the latest software version available. New CMU software versions are available for download on the R&S Lotus Notes Service board. To be loaded via the CMU's PCMCIA interface, the software must be copied to one or several flash disks/memory cards or PCMCIA hard disks as explained in the instructions supplied with the software download version. An appropriate memory card CMU-Z1, order no. 1100.7490.02, can be obtained from Rohde & Schwarz.

Note: *If your CMU is equipped with a floppy disk drive (option CMU-U61), a set of installation floppy disks must be generated instead of a flash disk. All other steps do not depend on the storage medium.*

To install the software proceed as follows:

- ➢ Switch off the CMU.
- ➢ Insert the flash disk into one of the two slots of the PCMCIA interface.
- ➢ Switch on the CMU.

The installation is started automatically while the CMU performs its start-up procedure. When ready to proceed, the *VersionManager* is displayed (for a detailed description of the *VersionManager* refer to chapter 1 of the CMU operating manual or to the on-line help accessible via *Info):*

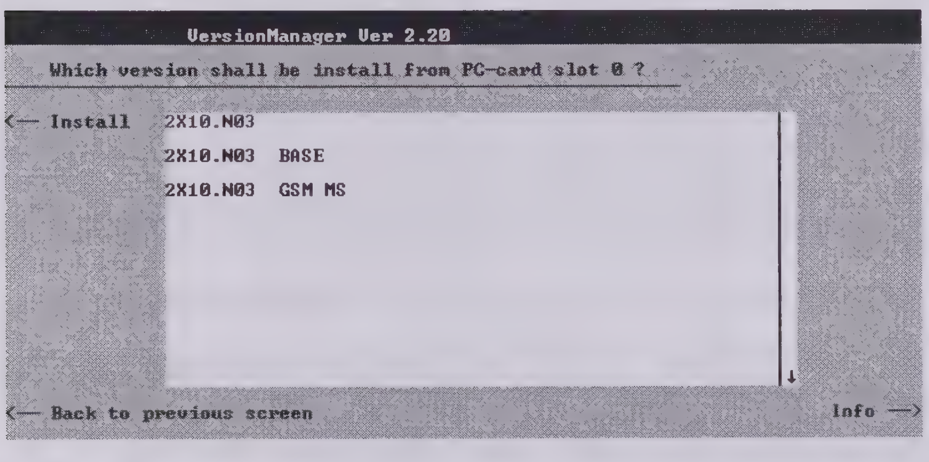


```
             VersionManager Ver 2.20
  the active CMU base software is the version: 2V20

<-- Activate other software                     Write log files to disk -->

<-- Delete software                             Delete non volatile ram -->

<-- Install software from PC-card slot 0                      Scan disk -->

<-- List software                             List all versions to disk -->

<-- Firmware update after board change    Copy non volatile ram to disk -->

<-- Edit service tables                                  Defragment disk -->
<-- Exit                                                            Info -->
```

Softkey no. 5 on the left softkey bar, *Install software...*, is used to install new software from an external storage medium. The CMU automatically recognizes the storage medium and indicates the corresponding slot number: Slot 0 or 1 denotes the left or right slot of the PCMCIA interface. If a floppy disk is used, the menu option reads *Install software version <version> from floppy.*

➢ Press left softkey no. 5 *(Install software...)* to start the installation.

If your storage medium contains several installation versions, the software version selection dialog is opened:

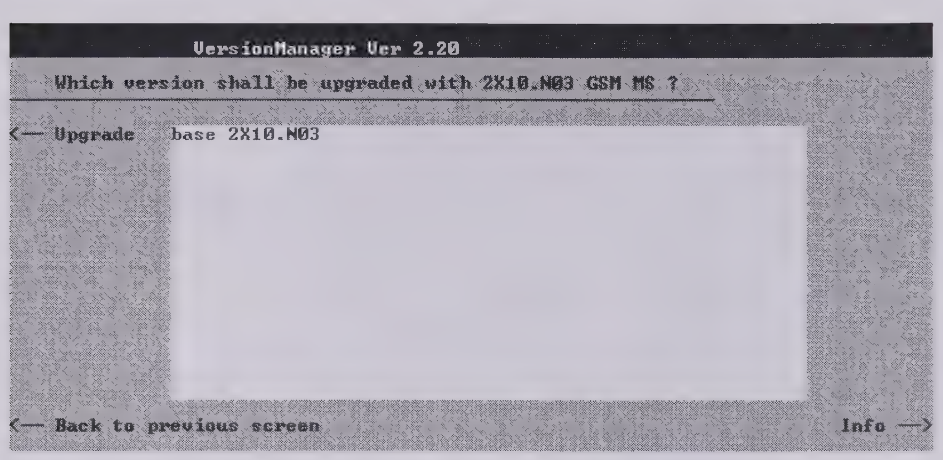


```
             VersionManager Ver 2.20
  Which version shall be install from PC-card slot 0 ?

<-- Install   2X10.N03
              2X10.N03  BASE
              2X10.N03  GSM MS

<-- Back to previous screen                                         Info -->
```

➢ Use the rotary knob or the cursor keys to scroll the list and select the *Measurements* version you intend to install.

➢ Press *Install* to start the installation.

The installation is started. To be operable on your instrument, a network option must be combined with a compatible version of the CMU base software. Any base software version installed on the CMU hard disk can be combined with one or several network options to form an independent software configuration. If none of the configurations is compatible to the new *Measurements* option, the *VersionManager* displays an error message and takes you back to the software selection dialog; see section *Creating a new Software Configuration* on page 1.5. Otherwise, the following upgrade selection dialog is opened:


VersionManager Ver 2.20

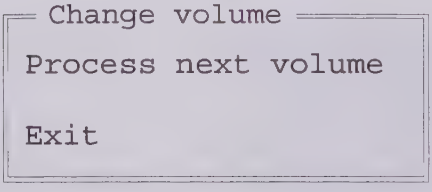
Which version shall be upgraded with 2X10.N03 GSM MS ?

base 2X10.N03

The upgrade selection dialog displays a list of base software versions that can be combined with the new *Measurements* software.

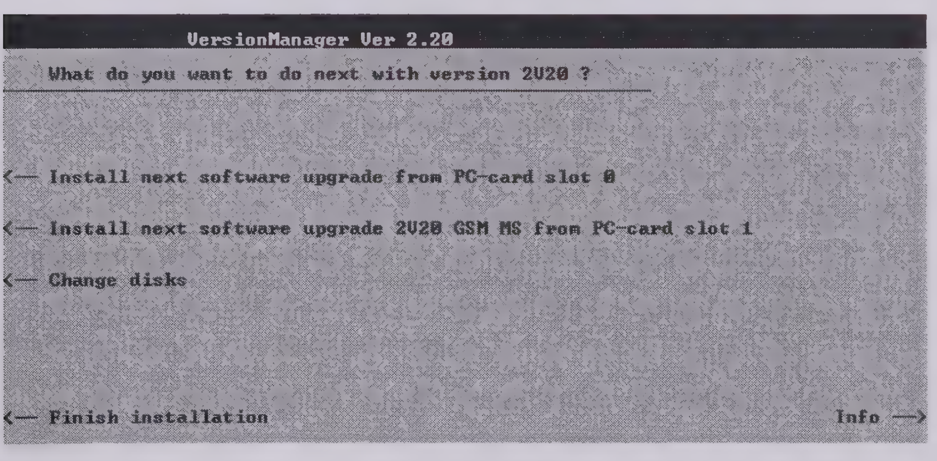
- ➢ Select the appropriate base version and press *Upgrade*.

The new *Measurements* option is added to the configuration or updates the previous *Measurements* version of the configuration. To indicate that the storage medium must be changed the CMU issues the *Change volume* message:


Change volume

- ➢ Replace the current disk with the disk requested.
- ➢ Use the cursor up/down keys to select “Process next volume” (default setting).
- ➢ Press *ENTER* to confirm that the new disk has been inserted and to continue the installation.

After processing the last disk the CMU displays the following screen:


VersionManager Ver 2.20

What do you want to do next with version 2V20 ?

<— Install next software upgrade from PC-card slot 0
<— Install next software upgrade 2V20 GSM MS from PC-card slot 1
<— Change disks
<— Finish installation
Info —>

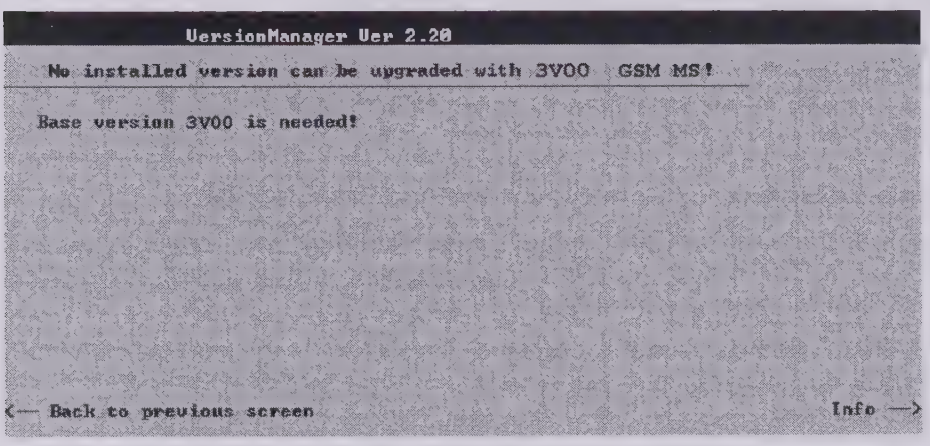
- ➢ If you wish to install or upgrade other software versions, press left softkey no 4 or 5 *(Install next software...)* or insert new storage medium into the PCMCIA slot or floppy disk drive and press *Change disks*.
- ➢ To finish the installation, remove all disks from the drive and press *Finish installation*.

The *VersionManager* is closed and the CMU is rebooted. The new firmware options are now operational and listed in the *Menu Select* menu together with their version number. Besides, the last software configuration installed is automatically taken as the active one in the next measurement session.

Creating a new Software Configuration

The CMU handles base software versions and network options on a separate basis. Different versions of the base software can be combined with different options to create new firmware configurations. For example, it is possible to update the base software without affecting the associated network options or vice versa. Moreover, the same base software version can be installed several times and combined with different network options (and vice versa), so it may enter into several firmware configurations.

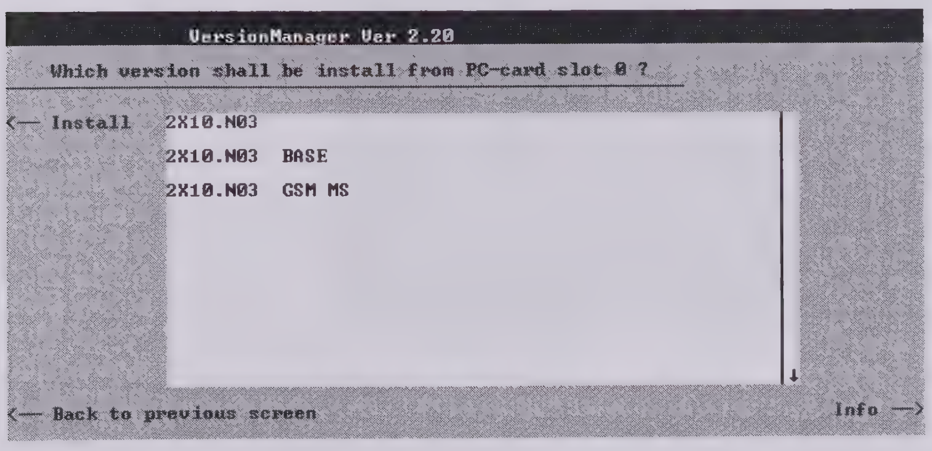
If no compatible base software version can be found on the hard disk, then the CMU will refuse to install a new *Measurements* software option selected in the software selection dialog (see previous section). Instead, it displays the following error message:



No installed version can be upgraded with 3V00 GSM MS!

Base version 3V00 is needed!

- ➢ Press *Back to installation* to return to the software version selection dialog.



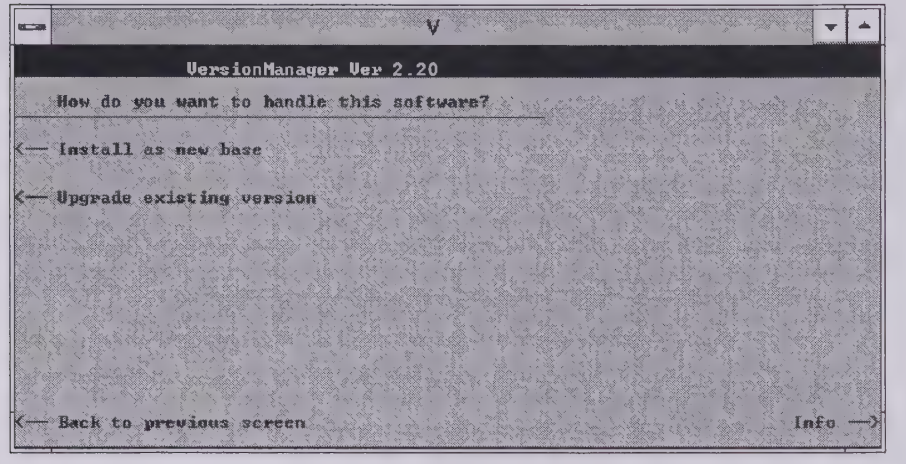
Which version shall be install from PC-card slot 0 ?

2X10.N03
2X10.N03 BASE
2X10.N03 GSM MS

- ➢ Select a base software version that is compatible to your *Measurements* software option and press *Install*.

Note: *As a rule, firmware versions for the base system and for network options are compatible if they differ only in the last digit. CDMA2000 firmware versions 3.10 to 3.19 (if available) can be run together with base system version 3.10 to 3.19 (if available).*

With a new base software version, it is possible to either update an existing configuration or create a new one. A dialog selecting between the two alternatives is opened:



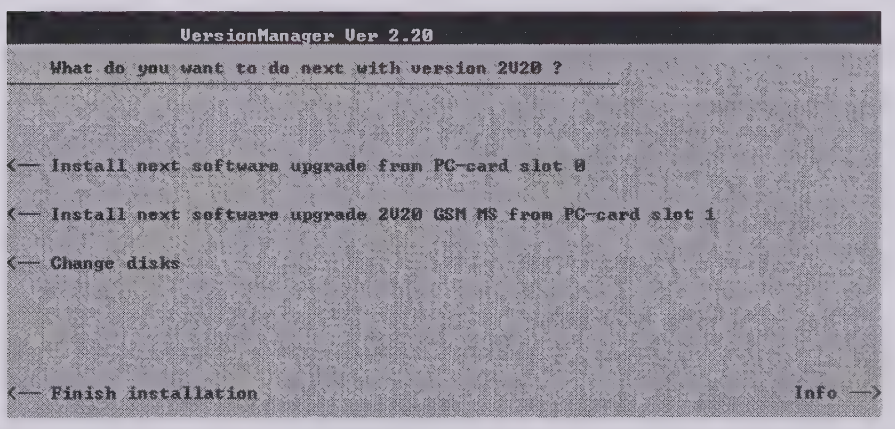
VersionManager Ver 2.20

How do you want to handle this software?

Note: *This dialog is skipped if the new base software version is not compatible with any of the existing configurations. An incompatible new base software must be installed as a new base software.*

- ➢ If you wish to add a new configuration to your hard disk, press *Install as new base*.
- ➢ To upgrade an existing configuration with the selected base software version in order to make it compatible to the new *Measurements* software option, press *Upgrade existing version*. The existing version to be upgraded must be selected in an additional dialog.

The installation is performed as described in section *Software Installation or Update* on p. 1.1. After adding the new base software as a new configuration or updating the existing configuration, the CMU displays the following screen:



VersionManager Ver 2.20

What do you want to do next with version 2020 ?

<— Install next software upgrade from PC-card slot 0
<— Install next software upgrade 2020 GSM MS from PC-card slot 1
<— Change disks
<— Finish installation
Info —>

- ➢ Press left softkey no 4 or 5 *(Install next software...)* and proceed as described in section *Software Installation or Update* on p.1.2. to install the new *Measurements* version and assign it to the new configuration.

Enabling Software Options

A new CMU software option purchased is ready to operate after it is enabled by means of a key code supplied with the option. This key code is to be entered into the *Option Enable* popup window which in turn can be opened via from the *Setup – Options* menu. For details refer to Chapter 4 of the CMU Operating manual.

Note: *The CMU software is delivered in complete versions containing all software options available. Software installation and enabling of software options are completely independent from each other.*

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2 Getting Started 2.3

Connecting a Mobile Phone 2.4

Non-Signalling Mode 2.8

Signalling Mode 2.12
    Call Setup and Signalling Parameters 2.12
    Power Measurements 2.20
    Modulation Measurements 2.26

2 Getting Started

This chapter provides examples of using the CMU Universal Radio Communication Tester to perform tests on an PCS mobile station (CDMA2000). It is intended to provide a quick overview of the CDMA2000 function groups *Non-Signalling* and *Signalling* and their functionality.

NOTE: *The tests and screen shots provided in the manual are based on the* CDMA2000 450 *function group.*

Before starting any measurements with the CMU, please note the instructions given in Chapter 1 of the CMU Operating manual for putting the instrument into operation. Chapters 2 through 4 of the CMU Operating manual contain information on customizing the instrument and display according to your personal preferences. For instructions about activating the CDMA2000 option, refer to Chapter 1 of this manual.

The procedures in this chapter include:

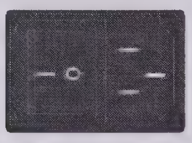
- Analyzer/Generator operation in *Non-Signalling* mode,
- Connection of the phone and selection of signalling parameters
- Power and modulation measurements in *Signalling* mode.

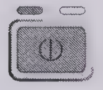
The left side of each double column page illustrates the steps and results obtained on the CMU screen. The right column of the page provides additional information on each step. If available, alternative settings and related measurements are provided.

Manual operation principles are discussed in Chapter 3. All menus, functions, and parameters (including CDMA background information) are discussed in Chapter 4.

Connecting a Mobile Phone

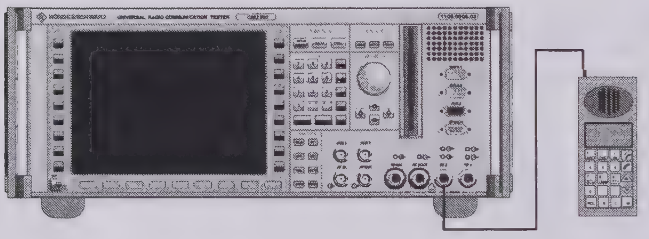
This chapter describes how to use the CMU to perform CDMA2000 mobile phone tests. Prior to starting any tests, the CMU must be correctly set up and connected to the AC power supply as described in the CMU operating manual. The CDMA option must be enabled as described in chapter 1 of this manual.





Step 1

- Switch on the CMU using the mains switch on the rear panel.
- Check the status of the ON/STANDBY key on the front panel. The yellow LED should be illuminated indicating the CMU is in the standby operating mode.

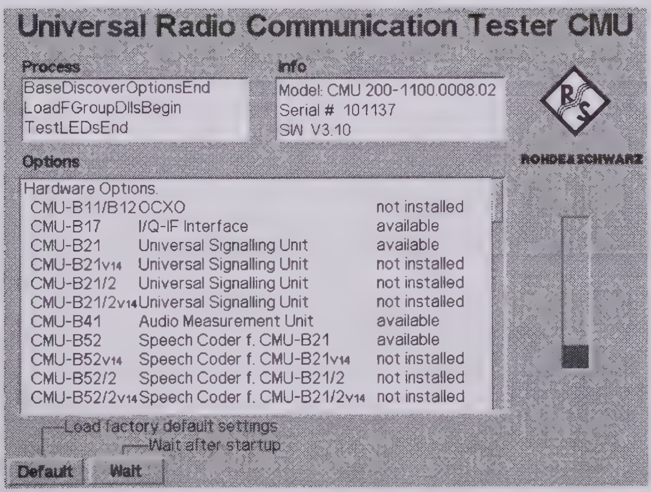


Step 2

- Connect the bi-directional RF connector RF 2 of the CMU to the antenna connector of the mobile phone (operating in the CDMA cellular network).
- Supply the mobile phone with the correct operating voltage (battery or power supply).
- Turn the mobile phone on.

Step 3

- Press the *ON/STANDBY* front panel key on the CMU.



```
Universal Radio Communication Tester CMU
Process                          Info
BaseDiscoverOptionsEnd           Model: CMU 200-1100.0008.02
LoadFGroupDllsBegin              Serial #  101137
TestLEDsEnd                      SW  V3.10
Options
Hardware Options.
 CMU-B11/B12 OCXO                                      not installed
 CMU-B17       I/Q-IF Interface                        available
 CMU-B21       Universal Signalling Unit               available
 CMU-B21v14    Universal Signalling Unit               not installed
 CMU-B21/2     Universal Signalling Unit               not installed
 CMU-B21/2v14  Universal Signalling Unit               not installed
 CMU-B41       Audio Measurement Unit                  available
 CMU-B52       Speech Coder f. CMU-B21                 available
 CMU-B52v14    Speech Coder f. CMU-B21v14              not installed
 CMU-B52/2     Speech Coder f. CMU-B21/2               not installed
 CMU-B52/2v14  Speech Coder f. CMU-B21/2v14            not installed
```

The startup menu displays while the CMU performs the power-up tests (see also additional information on p. 2.7).

After the power-up tests are complete, the CMU returns to the last menu used in the previous session.

Additional Information...

... on Step 1

Mains switch on the rear panel

When the mains switch at the rear is set to *OFF*, the instrument is disconnected from the power supply. When the mains switch is set to *ON*, the instrument is in standby mode or in operation, depending on the *ON/STANDBY* key.

***ON/STANDBY* key on the front panel**

The *ON/STANDBY* key determines whether the instrument is in standby mode or in operation.

Standby mode:

Only the reference frequency oscillator is supplied with operating voltage, and the orange LED (STANDBY) is illuminated.

Operation:

The green LED (ON) is illuminated and all modules of the instrument are supplied with operating voltage.

... on Step 2

RF connection of the mobile phone

A high-quality cable should be used for this connection, ideally with an attenuation of less than 0.5 dB.

Input and output connectors can be selected in the *AF/RF* ⊖ tab of the *Connect. Control* menu. The tab is also used to report an external input and output attenuation to the CMU.

Ensure that the attenuation of any antenna coupler and/or cables used is being taken into account by the CMU. During the test, the mobile receiver is being tested with very low RF signal levels, and even a small attenuation can cause the CMU to show a fail indication.

An external signal from a real network may interfere with the signal sent from the CMU to the mobile. The tests should ideally be performed in a shielded room, however, if this is not possible, the channel(s) used for the test should be changed. If different results are obtained on neighboring channels, the problem is likely to be due to external interference.

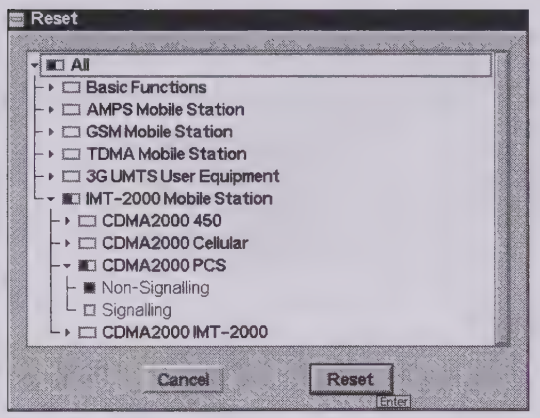
Alternative Settings and Measurements

☞ Chapter 1 of the CMU operating manual

The CMU provides two bidirectional RF connectors (RF1 and RF2) differing by their input and output levels. RF2 is the recommended connector for CDMA mobile phones.

The unidirectional connectors RF4 IN and RF3 OUT are intended for connecting modules requiring high input levels or modules with low RF output levels. RF4 IN and RF3 OUT can also be used to connect CDMA mobiles off the air via antennas.

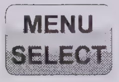
Step 4



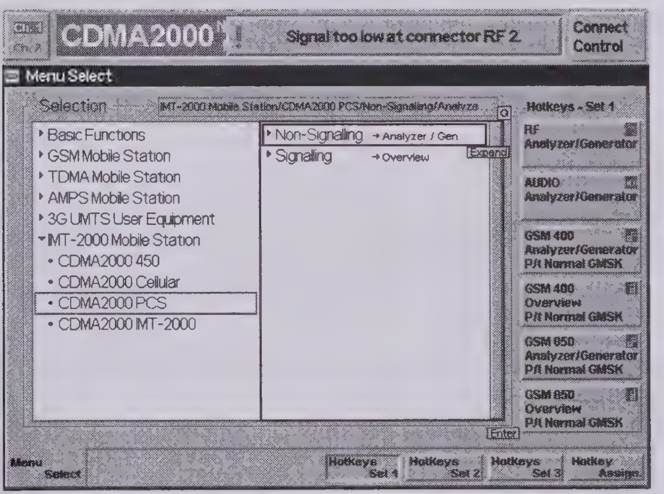
- ➢ Press the *RESET* key to open the *Reset* popup menu.
- ➢ Proceed as described in Chapter 4, section *Reset of Instrument Settings*, of the CMU 200/300 operating manual to expand the tree of function groups.
- ➢ Select the CDMA2000 function groups corresponding to your mobile type (here: PCS) to be reset. The corresponding nodes must be black.
- ➢ Use the cursor keys to activate the *Reset* button and press *ENTER.*
- ➢ In the popup window opened *(Are you sure?)*, select *Yes* to confirm the instrument reset.

The CMU indicates that it performs a partial reset of the two selected function groups and is then ready to carry out the following steps. The *Reset* popup menu is closed automatically.

Step 5



- ➢ Press the *Menu Select* key to open the *Menu Select* menu.


Signal too low at connector RF 2.

Selection IMT-2000 Mobile Station/CDMA2000 PCS/Non-Signalling/Analyze

The *Menu Select* menu indicates the function groups available. If a function group is selected, the corresponding modes and measurement menus are indicated.

From this menu, you can choose to operate in either the *Non Signalling* mode or the *Signalling* mode.

The remainder of the chapter is divided into each of these modes.

Additional Information...

Alternative Settings and Measurements

... on Step 3

Startup menu

The startup menu displays the following information:

- the status of the startup test *(Process),*
- the device name, serial number and software version *(Info),*
- the options and equipment installed *(Options),*
- the progress of the startup test (*Startup* bar graph).

Before starting a measurement, a reset is recommended to put the CMU in a known operating mode.

☞ Chapter 4 of CMU operating manual

Chapter 4 also contains information on customizing the CMU.

... on Step 4

The CMU indicates that it performs a reset of all settings in the selected function group(s). After finishing, the CMU is ready to carry out the remaining steps. The *Reset* popup menu closes automatically.

... on Step 5

Menu Select menu

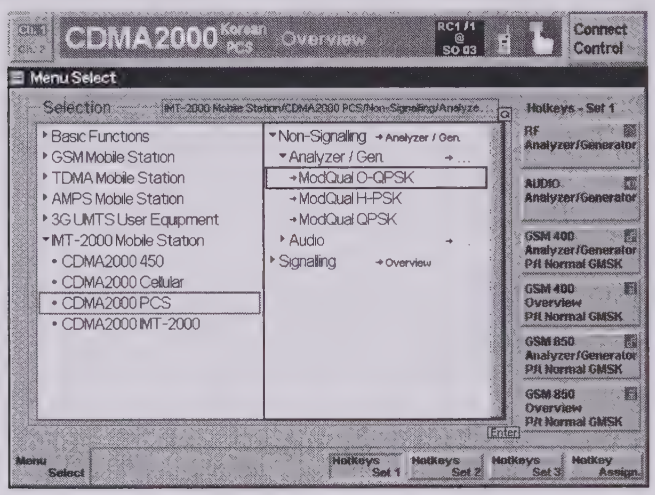
The *Menu Select* menu shows all function groups installed and enabled on the CMU. Each of the the function groups under the PCS Mobile Station function group is subdivided in the two measurement modes *Non-Signalling* and *Signalling*, each containing measurement menus.

☞ Chapter 3

Non-Signalling Mode

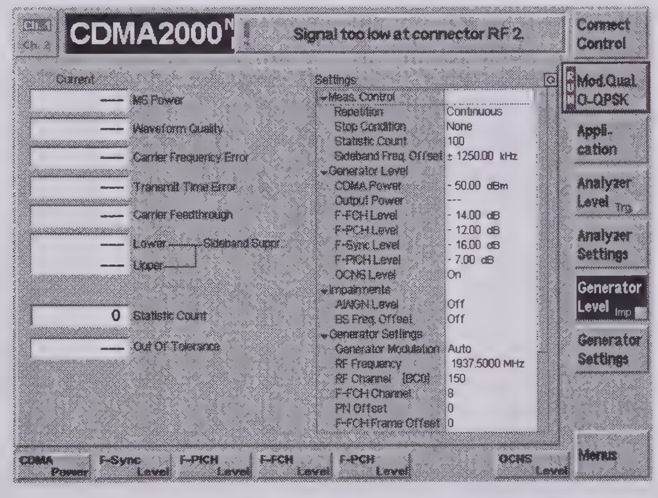
In the *Non-Signalling* mode, a specific RF signal can be generated and an RF signal with CDMA characteristics analyzed. Compared to the *Signalling* mode test times may be reduced considerably. Moreover, the measurements are not restricted to the specified channel and MS output power ranges of the network. The most common application is module test and test of mobiles in a special *test mode*.

In our example we use the CDMA2000 signal generated by the CMU itself to demonstrate the main features of the *Non Signalling* mode. This is analogous to the *RF* measurement example in the CMU operating manual.



Step 1

- ➢ Select a CDMA2000 function group, e.g. *CDMA2000 PCS.*
- ➢ Select the Non-Signalling mode and expand the list.
- ➢ Scroll down to *Analyzer/Generator* and expand the list.
- ➢ Scroll down to *ModQual O-QPSK* and press ENTER.
- ➢ This displays the *Analyzer/Generator* screen and starts the O-QPSK modulation quality measurement.



Signal too low at connector RF 2.

--- MS Power
--- Waveform Quality
--- Carrier Frequency Error
--- Transmit Time Error
--- Carrier Feedthrough
--- Lower Sideband Suppr.
--- Upper
0 Statistic Count
--- Out Of Tolerance

Meas. Control
Repetition: Continuous
Stop Condition: None
Statistic Count: 100
Sideband Freq. Offset: ± 1250.00 kHz
Generator Level
CDMA Power: - 50.00 dBm
Output Power: ---
F-FCH Level: - 14.00 dB
F-PCH Level: - 12.00 dB
F-Sync Level: - 16.00 dB
F-PICH Level: - 7.00 dB
OCNS Level: On
Impairments
AWGN Level: Off
BS Freq. Offset: Off
Generator Settings
Generator Modulation: Auto
RF Frequency: 1937.5000 MHz
RF Channel [BC0]: 150
F-FCH Channel: 8
PN Offset: 0
F-FCH Frame Offset: 0

Step 2

The *Analyzer/Generator* screen displays the current power and modulation measurement results and the RF generator and analyzer settings of the CMU.

Output fields displaying "---" indicate that no valid measurement results are available. At present no results are available because the CMUr receives no RF signal. A yellow message box *Signal too low at connector RF 2* displays across the top of the menu.

- ➢ Proceed as outlined in section *RF Non Signalling Measurements*, chapter 2 of CMU200 operating manual to connect RF1 to RF2 via a coax cable. Open the *Connection Control* menu and perform the appropriate RF input and output settings.

Additional Information...

Alternative Settings and Measurements

... on Step 2

Analyzer/Generator screen

The *Analyzer/Generator* screen contains two panels of information:

- Measurement results
- Settings

☞ Chapter 4

The section *CDMA Module Tests* in Chapter 4 of this manual provides detailed information about all measurement settings, measurement results, and a description of all softkey/hotkey menu buttons.

The status of the *Modulation* measurement is included in the softkey. For ongoing measurements, the results in the output fields are constantly updated.

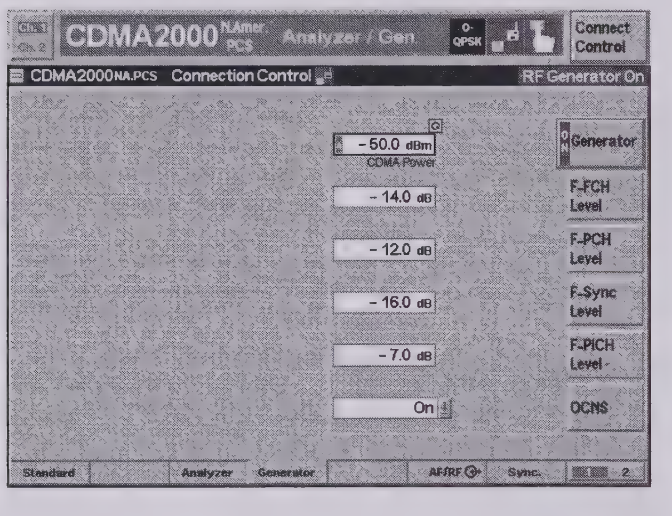
The current options for the measurement state are *RUN* (default) and *OFF*. A third state, *HLT*, occurs after a single-shot measurement.

Changing the RF Channel number automatically adjusts the base station's transmit and receive frequencies (BS Tx Frequency and BS Rx Frequency) to the corresponding RF Channel number.

Once selected, the Generator or Modulation measurement is switched off and on again by means of the toggle key *ON/OFF*.

The *Audio* hotkey displays the measurement screen for making audio measurements. These functions and settings are described in the CMU Operating manual.

☞ CMU Operating manual



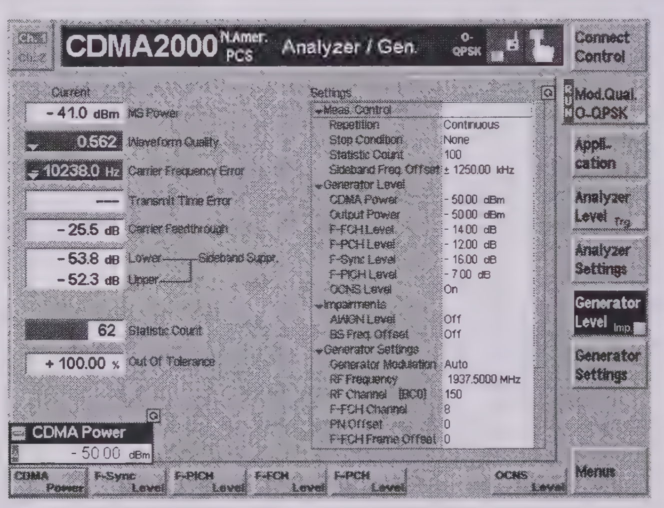
CDMA Power: - 50.0 dBm
F-FCH Level: - 14.0 dB
F-PCH Level: - 12.0 dB
F-Sync Level: - 16.0 dB
F-PICH Level: - 7.0 dB
OCNS: On

Step 3

- ➢ Press the *Connect Control* softkey. This displays the Connection Control screen.
- ➢ Select the *Generator* tab at the bottom of the display.

The Generator settings allow you to adjust all generator settings and turn the RF Generator on or off.

- ➢ Select (press) the *Generator* softkey and press *ON/OFF* to turn on the RF generator.
- ➢ Press the *Connect Control* softkey again to return to the measurement screen.



Current
- 41.0 dBm MS Power
0.562 Waveform Quality
10238.0 Hz Carrier Frequency Error
--- Transmit Time Error
- 25.5 dB Carrier Feedthrough
- 53.8 dB Lower Sideband Suppr.
- 52.3 dB Upper Sideband Suppr.
62 Statistic Count
+ 100.00 % Out Of Tolerance

CDMA Power - 50.00 dBm

Settings	
Meas. Control	
Repetition	Continuous
Stop Condition	None
Statistic Count	100
Sideband Freq. Offset	± 1250.00 kHz
Generator Level	
CDMA Power	- 50.00 dBm
Output Power	- 50.00 dBm
F-FCH Level	- 14.00 dB
F-PCH Level	- 12.00 dB
F-Sync Level	- 16.00 dB
F-PICH Level	- 7.00 dB
OCNS Level	On
Impairments	
AWGN Level	Off
BS Freq. Offset	Off
Generator Settings	
Generator Modulation	Auto
RF Frequency	1937.5000 MHz
RF Channel [BC0]	150
F-FCH Channel	8
PN Offset	0
F-FCH Frame Offset	0

Step 4

- ➢ Press the *Analyzer Settings* softkey. This displays a set of hotkeys at the bottom of the screen.

The hotkeys at the bottom of the screen allow you to directly adjust the measurement control settings without opening an additional configuration menu.

- ➢ Press the *RF Frequency* softkey and adjust the analyzer frequency to the default generator frequency of 1937.5 MHz.
- ➢ If the input signal level at RF2 is still too low, press *Generator Level – CDMA Power* and increase the RF generator level.

Additional Information...

Alternative Settings and Measurements

... on Step 3

The *Generator* tab has two screens of settings. Pressing the hotkey toggles the display between the two screens.

☞ Chapter 4

Additional tabs of the *Connection Control* screen allow the setup and control of other aspects of the CMU. These settings are described in Chapter 4 of this manual.

... on Step 4

After *Reset*, all parameters are set to their default values. The parameters are displayed in the *Settings* window.

☞ Chapter 4

Additional measurement settings are provided in the *Modulation Configuration* pop-up window. The *Modulation Configuration* pop-up window is accessed by pressing the measurement softkey twice (or once if already selected). In this example, the measurement softkey is labeled *Mod.Qual. O-QPSK*.

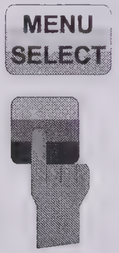
User-defined parameters are saved for later sessions when the CMU is switched off.

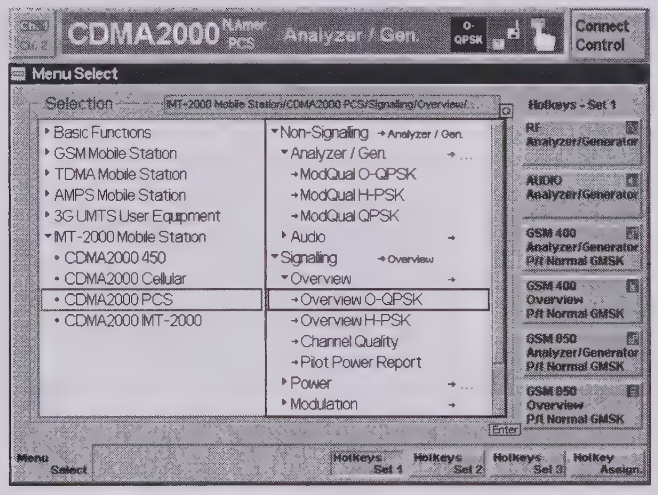
Signalling Mode

In the Signalling mode the CMU transmits a pilot, sync, and paging channel signal to which the mobile is able to synchronize. A call can then be established from either the CMU or the mobile.

Call Setup and Signalling Parameters

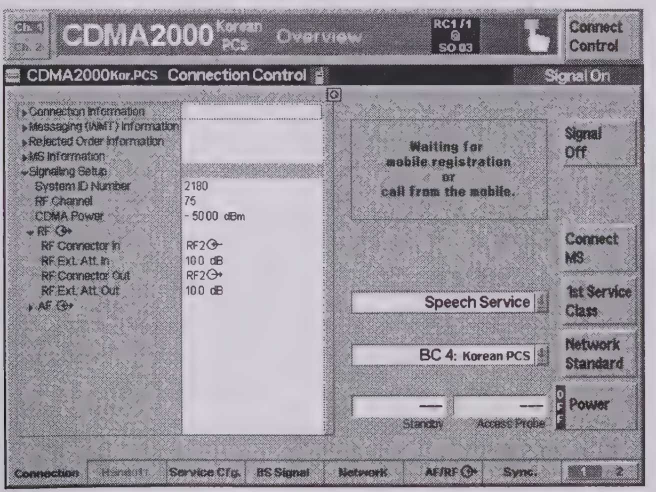
The signalling processes and configurations are controlled via the *Connection Control* popup menu. The *Connection Control* popup menu is automatically displayed when the *Signalling* Mode is selected.





Step 1

- ➢ Make sure that your mobile phone is connected to the CMU as described in section Connecting a Mobile Phone on p. 2.4 ff.
- ➢ Press the *Menu Select* key to open the *Menu Select* menu.
- ➢ Select the function group appropriate for your mobile phone, e.g. CMDA2000 PCS.
- ➢ Select the *Signalling* test mode and expand the list.
- ➢ Scroll to *Overview* and expand the list.
- ➢ Scroll to *Overview O-QPSK*.
- ➢ Press the *Enter* key to activate the measurement and display the measurement screen.



System ID Number 2180
RF Channel 75
CDMA Power - 50.00 dBm
RF Connector In RF2
RF Ext. Att. In 10.0 dB
RF Connector Out RF2
RF Ext. Att. Out 10.0 dB

Waiting for mobile registration or call from the mobile.

Speech Service

BC 4: Korean PCS

The CMU immediately displays the *Connection Control* menu and turns on the registration signal.

Wait for the mobile station to register with the CMU.

Additional Information...

... on Step 1

Since making measurements requires a connection to a mobile station, the CMU immediately displays the *Connection Control* screen if a connection is not established prior to starting a measurement.
If the automatic display of the Connection Control screen is disabled, the measurement screen is displayed with or without a connection to the mobile. A connection must be established for any measurements to return results.
The default settings are usually appropriate for registration to occur with a properly connected mobile station.
Parameters most likely needing to be set (to match the mobile station) are:

- Network Standard
- BS RF channel
- System ID
- The CDMA power of the BS Signal or the external attenuation, especially if the mobile is connected via antenna.

Refer to Step 2 on the following pages.

Alternative Settings and Measurements

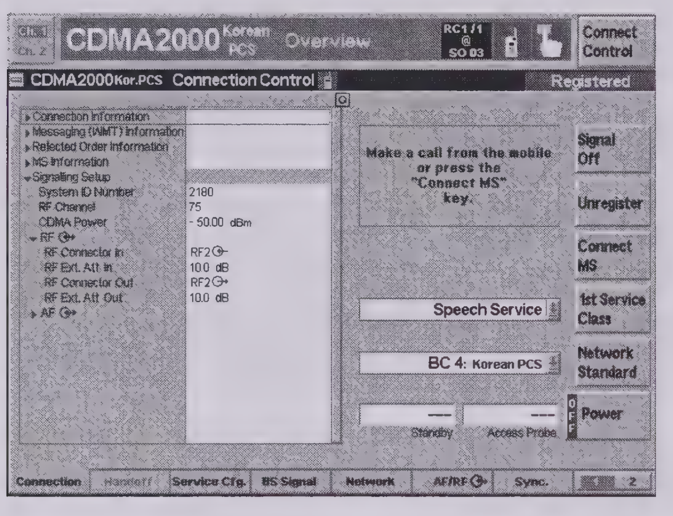
The immediate display of the connection control screen can be disabled by deselecting *Auto Open if not connected* under *Connection Control Behavior* in the *Misc.* tab of the *Connection Control* menu.

☞ Chapter 4

Step 2

After registration, the MS Information area now contains the important parameters characterizing the mobile station.

If the mobile doesn't register with the CMU, there may be configuration settings that don't match the mobile station. Check the requirements of the mobile station, signal settings, channels, and connections.



System ID Number 2180
RF Channel 75
CDMA Power - 50.00 dBm
RF Connector In RF2
RF Ext. Att In 10.0 dB
RF Connector Out RF2
RF Ext. Att Out 10.0 dB

Make a call from the mobile or press the "Connect MS" key.

Speech Service

BC 4: Korean PCS

Standby ---
Access Probe ---

Additional Information...

Alternative Settings and Measurements

... on Step 2

Connection Control is divided into pages accessed by the tabs at the bottom of the screen.

☞ Chapter 4.

The tabbed pages provide access to all signalling parameters. Typically the default settings allow a call to be established. The Connection Control parameter settings are global settings. Individual measurement settings override these global parameters.

Connection

The *Connection* tab displays the most important parameters characterizing the signals generated by the CMU.

Handoff

The *Handoff* tab displays the handoff capabilities of the CMU. In this instance, the tab is gray since there are no handoffs to be made.

Service Cfg.

The *Service Cfg.* tab displays the parameters of the fundamental channel.

BS Signal

The *BS Signal* tab displays the configuration settings to simulate a base station. From the *BS Signal* tab you can access the parameters set in the *Signalling* tab. In addition you can set the CDMA Levels and Handoff Parameters.

Network

The *Network* tab displays the configuration of the network identity and other parameters characterizing the network.

AF/RF ⊙→

Input/output connectors suitable for the type of measurements and signal levels must be chosen. An external input/output attenuation value can be specified in order to compensate for known attenuation of the input/output signal like those caused by cables.

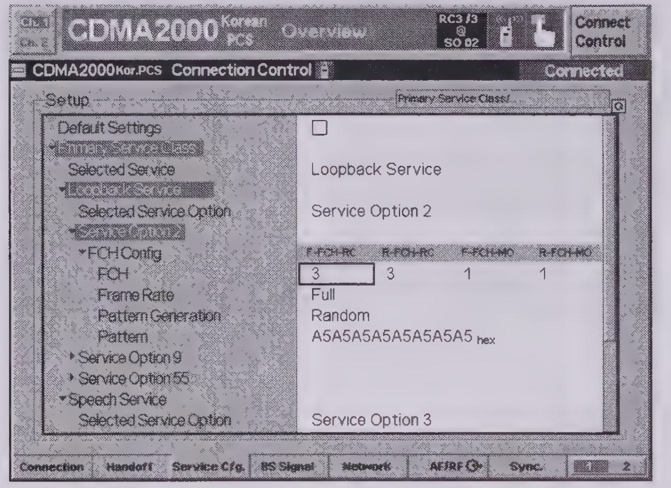
Input/output connectors and external attenuation are configured in the AF/RF ⊙→ tab.

Sync.

The *Sync.* tab defines the reference frequency and sync signal used by the CMU.

1 / 2

The 1 / 2 hotkey toggles between the first hotkey bar and a second bar providing the tabs for the I/Q-IF board settings, the trigger source, the analyzer configuration and control of the connection control behavior.



Setup — Primary Service Class/

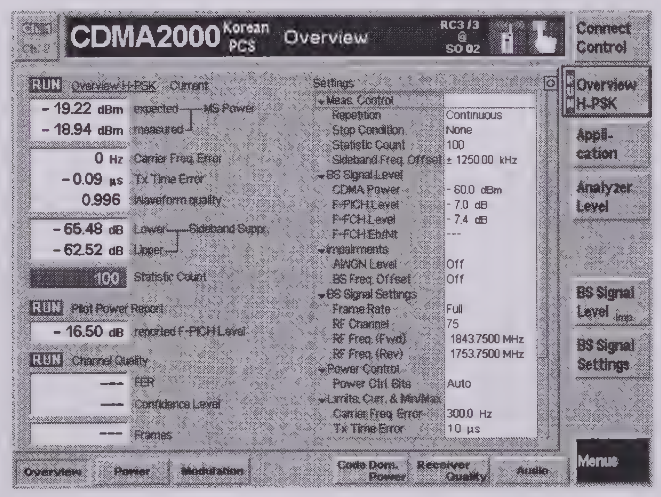
Default Settings	☐
Primary Service Class	
Selected Service	Loopback Service
Loopback Service	
Selected Service Option	Service Option 2
Service Option 2	
FCH Config	F-FCH-RC / R-FCH-RC / F-FCH-MO / R-FCH-MO
FCH	3 / 3 / 1 / 1
Frame Rate	Full
Pattern Generation	Random
Pattern	A5A5A5A5A5A5A5A5 hex
Service Option 9	
Service Option 55	
Speech Service	
Selected Service Option	Service Option 3

Step 3

- Press the 1st Service Class softkey and select the *Loopback Service*.
- To select the H-PSK modulation scheme set the radio configuration in the forward and reverse Fundamental Channel *(F-FCH-RC* and *R-FCH-RC)* to 3.

Step 4

- Return to the *Connection* tab and press the *Connect MS* softkey to establish a call with the mobile station.



RUN Overview H-PSK Current

- 19.22 dBm	expected MS Power
- 18.94 dBm	measured MS Power
0 Hz	Carrier Freq. Error
- 0.09 µs	Tx Time Error
0.996	Waveform quality
- 65.48 dB	Lower Sideband Suppr.
- 62.52 dB	Upper Sideband Suppr.
100	Statistic Count

RUN Pilot Power Report

- 16.50 dB	reported F-PICH Level

RUN Channel Quality

---	FER
---	Confidence Level
---	Frames

Settings

Meas. Control	
Repetition	Continuous
Stop Condition	None
Statistic Count	100
Sideband Freq. Offset	± 1250.00 kHz
BS Signal Level	
CDMA Power	- 60.0 dBm
F-PICH Level	- 7.0 dB
F-FCH Level	- 7.4 dB
F-FCH Eb/Nt	---
Impairments	
AWGN Level	Off
BS Freq. Offset	Off
BS Signal Settings	
Frame Rate	Full
RF Channel	75
RF Freq. (Fwd)	1843.7500 MHz
RF Freq. (Rev)	1753.7500 MHz
Power Control	
Power Ctrl. Bits	Auto
Limits, Curr. & Min/Max	
Carrier Freq. Error	300.0 Hz
Tx Time Error	1.0 µs

Step 5

After the call is established, the CMU displays the Overview O-QPSK measurement screen. This was the selection made in the function menu starting the connect procedure.

The Overview O-QPSK displays the current O-QPSK measurements.

The *Application* softkey displays a set of hotkeys of available applications while in the *Overview* measurement.

From this screen, you can adjust the base station signal levels or impairments.

The *Menus* softkey displays a set of hotkeys to switch to other measurement types.

Additional Information...

Alternative Settings and Measurements

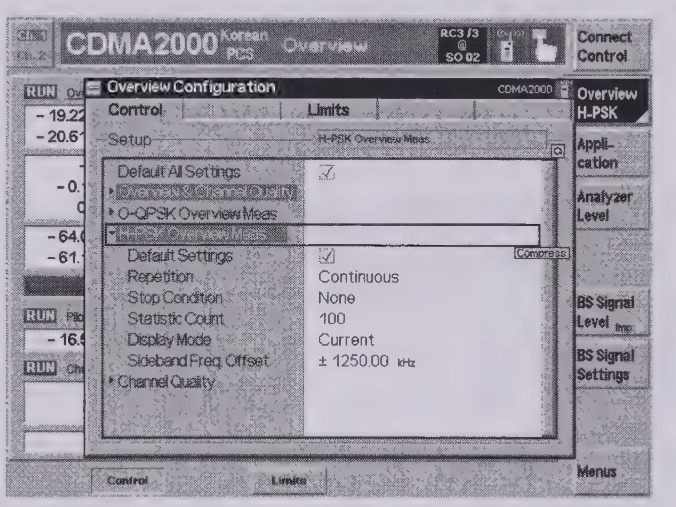
... on Step 3

The *1st Service Class* softkey displays the call mode method to use when connecting to the mobile station. *Loopback Service* is generally used for testing. *Speech Service* is used to place a voice call to the mobile.

CDMA2000 receiver quality measurements require that a Loopback Service call be established with the mobile station. The Speech Service mode is used to place a voice call to the mobile. Modulation measurements may run slower in Speech Service since the mobile station signal may not be using Full Rate.

The parameters for the service types are configured in the *Service Config.* tab.

☞ Chapter 4.



Overview Configuration — CDMA2000

Control | Limits

Setup: H-PSK Overview Meas

Default All Settings	☑
▸ Overview & Channel Quality	
▸ O-QPSK Overview Meas	
▾ H-PSK Overview Meas	
Default Settings	☑
Repetition	Continuous
Stop Condition	None
Statistic Count	100
Display Mode	Current
Sideband Freq. Offset	± 1250.00 kHz
▸ Channel Quality	

Step 6

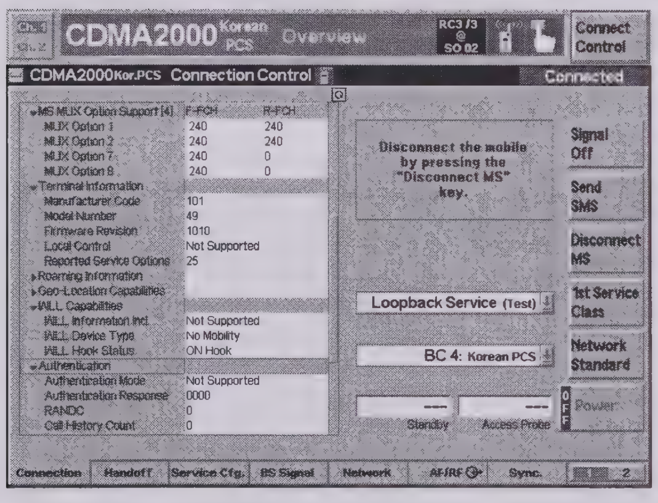
- ➢ Press the measurement softkey twice (once if already highlighted).

This displays the *Overview Configuration* screen to adjust control of the measurement and its limits.

Connect Control

Step 7

- ➢ Press the Connect Control softkey to display the Connection Control screen.



CDMA2000Kor.PCS Connection Control — Connected

	F-FCH	R-FCH
▾ MS MUX Option Support [4]		
MUX Option 1	240	240
MUX Option 2	240	240
MUX Option 7	240	0
MUX Option 8	240	0
▾ Terminal Information		
Manufacturer Code	101	
Model Number	49	
Firmware Revision	1010	
Local Control	Not Supported	
Reported Service Options	25	
▸ Roaming Information		
▸ Geo-Location Capabilities		
▾ WLL Capabilities		
WLL Information Incl.	Not Supported	
WLL Device Type	No Mobility	
WLL Hook Status	ON Hook	
▾ Authentication		
Authentication Mode	Not Supported	
Authentication Response	0000	
RANDC	0	
Call History Count	0	

Disconnect the mobile by pressing the "Disconnect MS" key.

Loopback Service (Test)

BC 4: Korean PCS

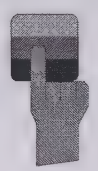
Standby: ---

Access Probe: ---

The *Connection Control* screen now indicates it is connected to the mobile.

Closing the *Connection Control* screen returns the CMU to the last measurement menu accessed. In this case the CMU returns to the *Overview* menu by default since no measurement menu has been displayed.

Connect Control



Step 8

- ➢ Press the *Connect Control* softkey again to return to the measurement screen.

Additional Information...

Alternative Settings and Measurements

... on Step 6

The *Overview Configuration* screen displays two tabs, Control and Levels. The Control tab contains all the settings that affect control of the measurement and the Limits tab contains all the settings to define the limits of the measurement.

☞ Chapter 4.

Softkeys and hotkeys

☞ Chapter 4.

To enlarge the diagram area of the graphical measurement menus, the left softkey column is suppressed. The functionality of each softkey on the right side is extended by hotkeys. These hotkeys are displayed in the hotkey bar below the diagram when the softkey is selected.

Configuration settings

Some of the softkey/hotkey combinations offer settings that can also be accessed via configuration menus. For example, the settings offered by the *CDMA Levels* softkey (for Gated Output) is equivalent to *Levels* in the *Control* tab (for Gated Output) of the *Power Configuration* menu. Identical settings overwrite each other.

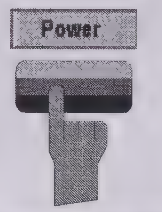
Each measurement group and each application (within the group) stores its own configuration settings. For example, the *Pilot Level* setting for the *Gated Output* application is separate from the *Pilot Level* setting for the *Open Loop Time Resp.* application.

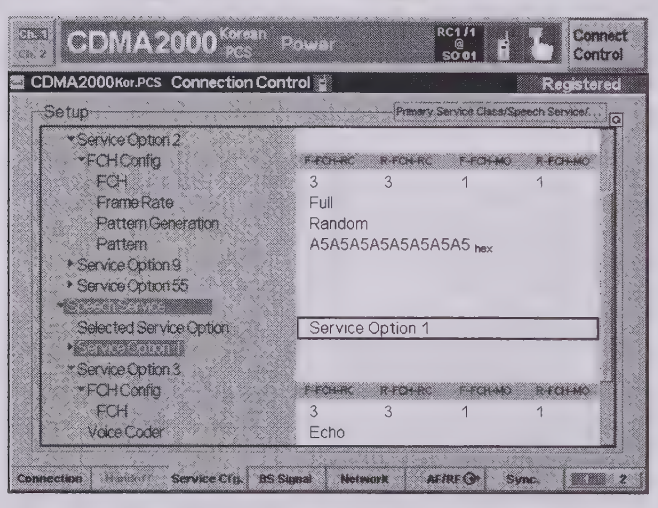
... on Step 8

Closing the *Connection Control* screen returns the CMU to the last measurement menu accessed. In this case the CMU returns to the *Overview* menu by default since no measurement menu has been displayed.

Power Measurements

The Power measurement menu provides information about the mobile station's power levels and performance. The CMU provides six applications to measure and display power measurements. In this signalling example, only the *Gated Output* application is selected.





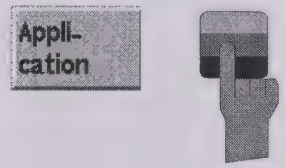
- Service Option 2
  - FCH Config
    - FCH: F-FCH-RC 3, R-FCH-RC 3, F-FCH-MO 1, R-FCH-MO 1
    - Frame Rate: Full
    - Pattern Generation: Random
    - Pattern: A5A5A5A5A5A5A5A5 hex
- Service Option 9
- Service Option 55
- Speech Service
  - Selected Service Option: Service Option 1
  - Service Option 1
  - Service Option 3
    - FCH Config
      - FCH: F-FCH-RC 3, R-FCH-RC 3, F-FCH-MO 1, R-FCH-MO 1
    - Voice Coder: Echo

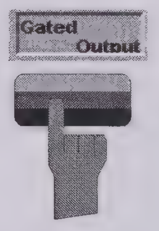
Step 1

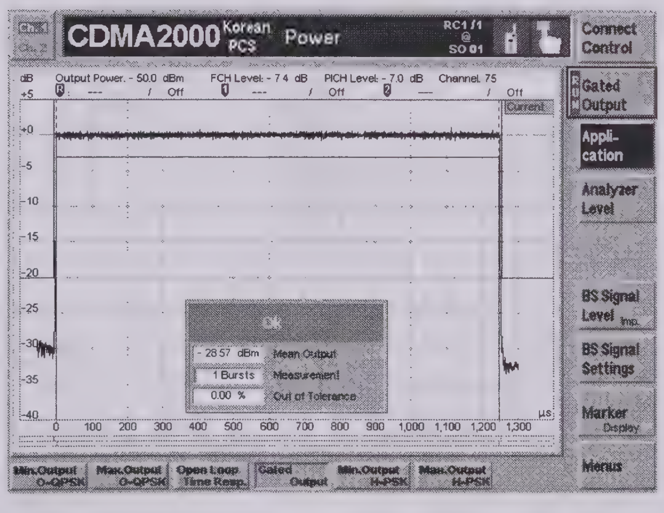
- ➢ Press the *Menu Select* key to open the *Menu Select* menu.
- ➢ Press the *Power* hotkey to switch to one of the Power measurement applications.

The last power application accessed is displayed. Most likely no measurement results are available with the current service configuration settings.

- ➢ Open the *Connection Control* menu, press the *Service Cfg.* softkey and select the *Speech Service* as the *Primary Service Class.*
- ➢ Select *Service Option 1* as shown in the figure.
- ➢ Close the *Connection Control* menu.







Output Power: - 50.0 dBm FCH Level: - 7.4 dB PICH Level: - 7.0 dB Channel: 75

R: --- / Off 1 --- / Off 2 --- / Off

- 28.57 dBm Mean Output
1 Bursts Measurement
0.00 % Out of Tolerance

Step 2

- ➢ Press the *Application* softkey. The available power applications are displayed in the hotkey bar.
- ➢ Press the *Gated Output* hotkey to change to the *Gated Output* application.

The *Gated Output* power application shows the gated output power as a function of time.

A tolerance template is displayed. The settings (default at this time) and scalar results are displayed in the parameter line above the diagram and in a message box positioned in the diagram area.

Additional Information...

... on Step 1

If the *Power* hotkey is not displayed, press the *MENU SELECT* key. The menu group *Power* contains the functions to measure the received signal power. The *Power Configuration* popup menu configures all power measurements.

Softkeys and hotkeys

To enlarge the diagram area of the graphical measurement menus, the left softkey column is suppressed. The functionality of each softkey on the right side is extended by hotkeys. These hotkeys are displayed across the hotkey bar below the diagram when the softkey is selected.

... on Step 2

There are six power applications (in the hotkey bar).

- *Minimum Output O-QPSK* measures the mobile station's minimum output power.
- *Maximum Output O-QPSK* measures the mobile station's maximum output power.
- *Open Loop Time Response* measures the open loop power control time response to an increase or decrease of the total base station power.
- *Gated Output* displays the time response of the mean output power for isolated gated-on power control groups.
- *Minimum Output H-PSK* measures the mobile station's minimum output power.
- *Maximum Output H-PSK* measures the mobile station's maximum output power.

Alternative Settings and Measurements

The *Application* softkey switches between the applications of the *Power* measurement.

The *Analyzer Level* softkey adjusts the RF input signal path.

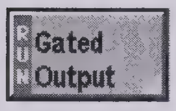
The *BS Signal Level/Impairments* softkey displays a set of hotkeys to adjust the total power and channel levels of the CMU's CDMA signal and add impairments.

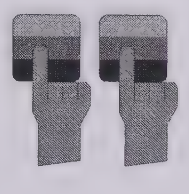
The *BS Signal Settings* softkey defines the frequency and frames rate of the CMU's CDMA signal.

The *Marker/Display* softkey sets markers and a D-line and rescales the diagram. (A D-line is used to mark levels and a reference point for markers.)

The *Menus* softkey changes between the individual measurement menus.

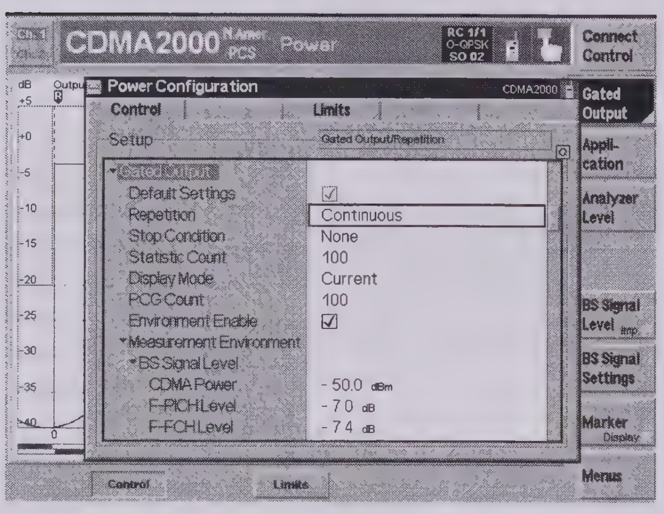
☞ Chapter 4.





Step 3

- ➢ Press the measurement softkey twice to open the *Power Configuration* menu. In this example, the measurement softkey is labeled *Gated Output*.



Power Configuration

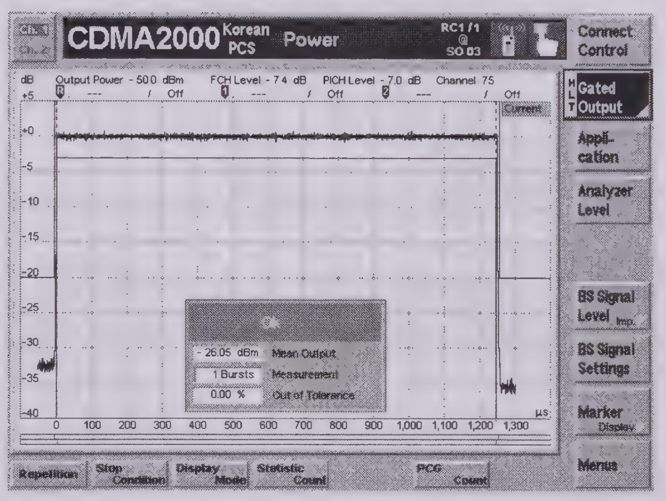
Setup — Gated Output/Repetition

Gated Output
- Default Settings ☑
- Repetition: Continuous
- Stop Condition: None
- Statistic Count: 100
- Display Mode: Current
- PCG Count: 100
- Environment Enable ☑
- Measurement Environment
  - BS Signal Level
    - CDMA Power: - 50.0 dBm
    - F-PICH Level: - 7.0 dB
    - F-FCH Level: - 7.4 dB

The *Power Configuration* menu defines each of the power measurement applications. In this example, we will adjust a parameter of the *Gated Output* application.

- ➢ Press the *Control* hotkey to display the *Control* tab.
- ➢ Scroll down to view the *Gated Output* parameters.
- ➢ Press the *EXP/CMP* key to expand the menu table.
- ➢ Scroll to the *Repetition* parameter, press *Enter*, and set it to *Single Shot*.

- ➢ Press the *ESCAPE* key to close the *Power Configuration* menu and return to the main menu.



Output Power - 50.0 dBm FCH Level - 7.4 dB PICH Level - 7.0 dB Channel 75

R --- / Off 1 --- / Off 2 --- / Off

- 26.05 dBm Mean Output

1 Bursts Measurement

0.00 % Out of Tolerance

The power measurement is stopped after one statistic cycle. The status indication next to the *Gated Power* softkey is set to *HLT*.

Additional Information...

... on Step 3

Repetition mode

Repetition determines the repetition mode of the measurement (single shot or continuous).

Single Shot: The measurement is stopped after a statistic cycle, i.e. after the number of waveform intervals/evaluation periods set in the configuration menu *Statistics.*

Continuous: The CMU continues the measurement until it is terminated explicitly or until the stop condition is met.

The *Stop Condition* setting can affect the Single Shot and Continuous repetition modes.

Softkeys and hotkeys

To enlarge the diagram area of the graphical measurement menus, the left softkey column is suppressed. The functionality of each softkey on the right side is extended by hotkeys. These hotkeys are displayed in the hotkey bar below the diagram when the softkey is selected.

Configuration settings

Some of the softkey/hotkey combinations offer settings that can also be accessed via configuration menus. For example, the settings offered by the *BS Signal Level* softkey (for Gated Output) is equivalent to *Levels* in the *Control* tab (for Gated Output) of the *Power Configuration* menu. Identical settings overwrite each other.

Each measurement group and each application (within the group) stores its own configuration settings. For example, the *Pilot Level* setting for the Gated Output application is separate from the *Pilot Level* setting for the *Open Loop time Resp.* application.

Alternative Settings and Measurements

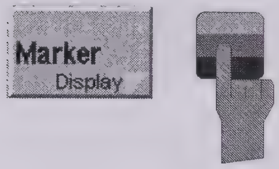
☞ Chapter 4,

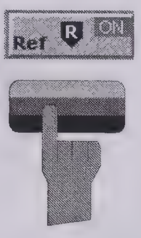
section *Measurement Environment.*

Settings made in the *Power Configuration* menu apply only to the power measurements.

Settings made in the *Connection Control* menu apply to the entire CDMA2000 function group. Individual measurements settings override these settings while the measurement is active.

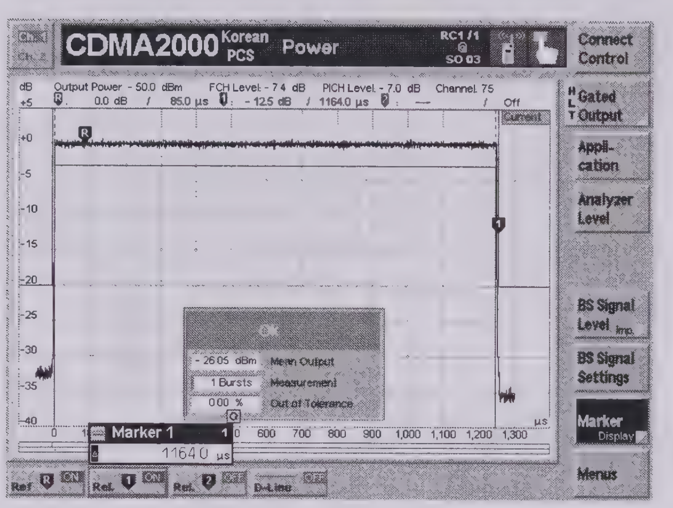
☞ Chapter 4.





Step 4

- Press the *Marker* softkey.
- Press the *Ref R* hotkey and enter a value to position the reference marker onto the trace.



Output Power - 50.0 dBm FCH Level: - 7.4 dB PICH Level: - 7.0 dB Channel: 75

R: 0.0 dB / 85.0 µs 1: - 12.5 dB / 1164.0 µs 2: --- / Off

- 26.05 dBm Mean Output
1 Bursts Measurement
0.00 % Out of Tolerance

Marker 1
1164.0 µs

The reference marker is positioned on the trace and the coordinates are displayed in the parameter line.

Additional Information...

... on Step 4

Markers

Markers are a graphical tool used to locate points on a trace and read out their coordinates. A reference marker and two delta markers may be defined in the *Power* menu.

The reference marker measures the absolute level of the trace. The delta markers either measure the distance between their position and the reference marker (relative mode) or the absolute level (absolute mode).

Alternative Settings and Measurements

☞ Chapter 4.

In addition to markers, a D-line can be used to measure a particular level in the diagram and used as a reference point for markers.

Modulation Measurements

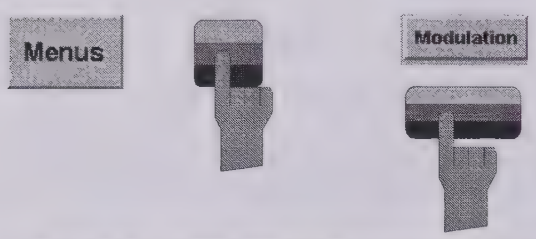
We can use the hotkey bar to switch over to the Modulation measurement.

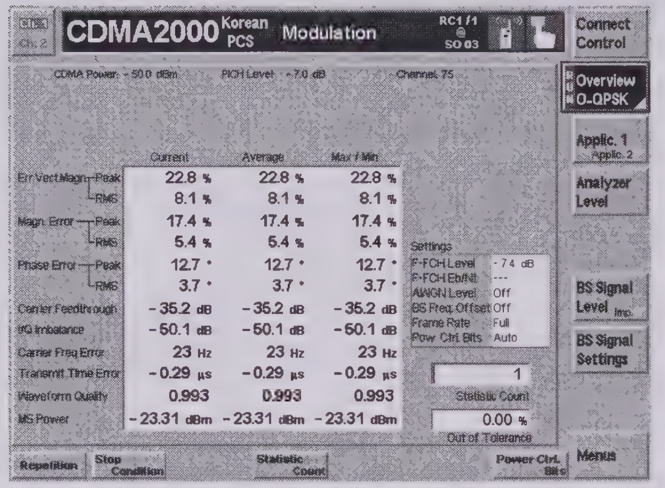
Step 1

- Press the *Menus* softkey to display the measurement groups in the hotkey bar.
- Press the *Modulation* hotkey to switch to the *Modulation* measurements.
- Press *Application* and select the *Overview O-QPSK* application (corresponding to the current service configuration).

The *Modulation - Overview* menu displays the main results of the *Modulation* measurement.

If a result exceeds the tolerances, the corresponding output field is red and an arrow pointing upwards or downwards indicates that the result is above or below the limit.





CDMA Power: - 50.0 dBm PICH Level: - 7.0 dB Channel: 75

	Current	Average	Max / Min
Err.Vect.Magn. Peak	22.8 %	22.8 %	22.8 %
RMS	8.1 %	8.1 %	8.1 %
Magn. Error Peak	17.4 %	17.4 %	17.4 %
RMS	5.4 %	5.4 %	5.4 %
Phase Error Peak	12.7 °	12.7 °	12.7 °
RMS	3.7 °	3.7 °	3.7 °
Carrier Feedthrough	- 35.2 dB	- 35.2 dB	- 35.2 dB
I/Q Imbalance	- 50.1 dB	- 50.1 dB	- 50.1 dB
Carrier Freq Error	23 Hz	23 Hz	23 Hz
Transmit Time Error	- 0.29 µs	- 0.29 µs	- 0.29 µs
Waveform Quality	0.993	0.993	0.993
MS Power	- 23.31 dBm	- 23.31 dBm	- 23.31 dBm

Settings

F-FCH Level	- 7.4 dB
F-FCH Eb/Nt	---
AWGN Level	Off
BS Freq. Offset	Off
Frame Rate	Full
Pow. Ctrl. Bits	Auto

Statistic Count: 1

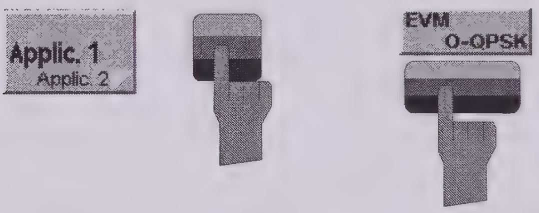
Out of Tolerance: 0.00 %

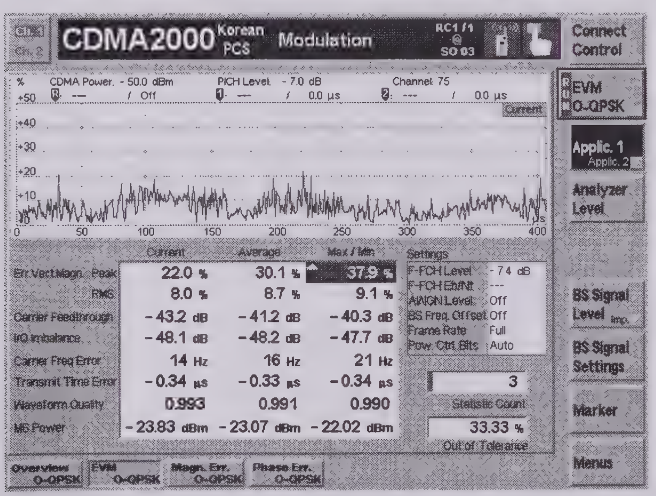
Step 2

- Press the *Application* hotkey again to display the available Modulation applications in the hotkey bar.
- Press the *EVM* hotkey to change to the Error Vector Magnitude application.

The *Modulation – Error Vector Magnitude* menu displays a graph of the *Error Vector Magnitude* as percentage vs. time.

The output fields below the graph correspond to the ones shown in the Overview application. Since we are viewing the *Error Vector Magnitude* application, the *Magnitude Error* and *Phase Error* are not shown.





CDMA Power: - 50.0 dBm PICH Level: - 7.0 dB Channel: 75

R: --- / Off 1: --- / 0.0 µs 2: --- / 0.0 µs

	Current	Average	Max / Min
Err.Vect.Magn. Peak	22.0 %	30.1 %	37.9 %
RMS	8.0 %	8.7 %	9.1 %
Carrier Feedthrough	- 43.2 dB	- 41.2 dB	- 40.3 dB
I/Q Imbalance	- 48.1 dB	- 48.2 dB	- 47.7 dB
Carrier Freq Error	14 Hz	16 Hz	21 Hz
Transmit Time Error	- 0.34 µs	- 0.33 µs	- 0.34 µs
Waveform Quality	0.993	0.991	0.990
MS Power	- 23.83 dBm	- 23.07 dBm	- 22.02 dBm

Settings

F-FCH Level	- 7.4 dB
F-FCH Eb/Nt	---
AWGN Level	Off
BS Freq. Offset	Off
Frame Rate	Full
Pow. Ctrl. Bits	Auto

Statistic Count: 3

Out of Tolerance: 33.33 %

Additional Information...

... on Step 1

Statistical quantities

The table in the *Overview* menu reports peak and RMS-averaged values of quantities characterizing the errors of the modulation vector. In addition, the scalar modulation results *Carrier Feedthrough, I/Q Imbalance,* Carrier *Frequency Error*, *Transmission Time Error*, *Waveform Quality*, and *MS Power* are indicated.

The values in the three columns of the table are calculated as follows:

- The *Current* column contains the results for the current measurement.
- The *Average* column contains the current results averaged over the last statistic cycle.
- The *Max./Min.* column contains the extreme values of the current results for all measurements.

... on Step 2

Applications

Applications are different measurements belonging to the same measurement group. Each application is assigned its own set of configuration parameters allowing configuration of each application individually.

The *Modulation* menu comprises the four applications *Overview O-QPSK*, *Error Vector Magnitude*, *Magnitude Error*, and *Phase Error*.

Measured values and limits

The limits may be modified in the *Limits* tab of the *Modulation Configuration* menu which is opened by pressing the measurement softkey twice. The *Modulation Configuration* menu is similar to the *Power Configuration* menu explained on the previous pages.

The absolute values are given for modulation measurements. This is why the display modes Minimum and Maximum can not be selected separately. The CMU displays the extreme values with the correct sign.

Alternative Settings and Measurements

☞ Chapter 4.

The measurement principle for phase and frequency errors is explained at the beginning of section *Modulation Measurement Menu.*

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3 Manual Control

This chapter gives a brief overview of the operating concept and structure of the user interface for CDMA mobile phone tests. The CMU is designed for maximum operating convenience and flexibility. All instrument functions are grouped together in menus. Each menu provides configuration settings, displays a group of measured quantities, or a combination of both. Switching between the different menu groups and signalling modes is possible at any time.

In the following sections, the different measurement modes and measured quantities are discussed. Settings and measurement parameters frequently encountered are explained from a general point of view.

The formal aspects of measurement control are discussed in more detail in Chapter 5 *(Remote Control – Basics)*. For information about the CMU's control elements, menu types and dialog elements within the menus refer to Chapter 3 of the CMU Operating manual.

Menu Structure

The menus used to control CDMA2000 measurements can be arranged in different ways. From a functional point of view, they form the following groups:

- The CDMA2000 function groups:
    - CDMA2000 450
    - CDMA2000 Cellular
    - CDMA2000 PCS
    - CDMA2000 IMT-2000
- The two tests modes:
    - Signalling
    - Non-Signalling
- General configurations (Connection Control)
- Measurement groups *(Analyzer/ Generator, Overview, Power, Modulation, Code Domain Power, Receiver Quality)*
- Configurations specific to the measurement groups

The CMU uses main menus, popup menus, graphical measurement menus and dialog windows of various size. Refer to Chapter 3 of the CMU Operating manual for discussions about menus.

Test Modes

CDMA2000 measurements are performed in one of the two modes *Signalling* or *Non Signalling*. The *Non Signalling* mode is typically used for module tests or test of mobiles in a special "test mode". The *Signalling* mode measures the mobile phone performance under realistic operating conditions where the CMU mimics a CDMA2000 base transceiver station.

Definition The term signalling denotes all actions necessary to establish, control and terminate a communication between the base station (CMU) and the mobile phone. The signalling messages conveyed allow the mobile station and the network to discuss the management of issues either related to the user or concerning technical aspects of the communication.

Non-Signalling Mode

In the *Non Signalling* mode, the CMU generates an RF signal conforming to CDMA2000 specifications and analyzes the signal transmitted by the device under test (DUT).

Signalling Mode

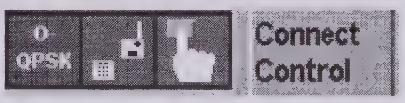
In the *Signalling* mode, the CMU first transmits a signal consisting of a pilot, sync, and paging channel. In subsequent steps, the mobile synchronizes to the channels, decodes the information transmitted, and performs a location update so that a call can be established from either the mobile or the CMU.

The signalling mode measures the mobile phone performance under realistic operating conditions where the CMU mimics a CDMA2000 base transceiver station. The CMU is able to configure a broad range of network parameters and to determine the parameters characterizing the mobile. Measurements of the power versus time, modulation parameters, and receiver quality can be performed.

Signalling Symbols

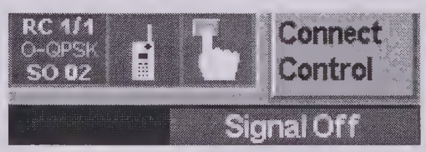
The signalling mode and state is indicated to the left of the operating mode in each main menu and measurement menu. The following icons (mobile station) represent each signalling mode and state:

Non-Signalling Mode

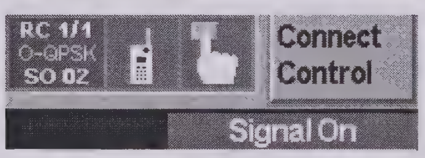


Non-Signaling Mode – Icon split

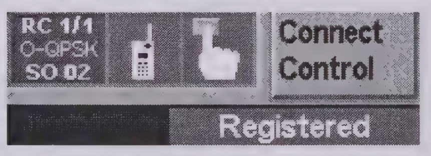
Signalling Mode



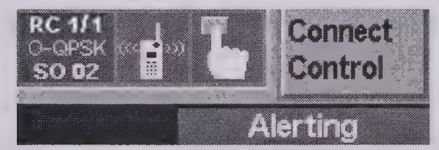
Signal Off – Icon has gray background



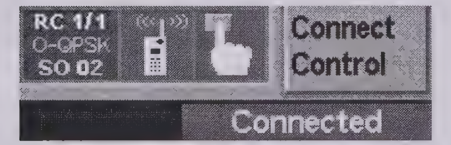
Signal On – No Icon



Registered – Icon has green background



Alerting (Speech)



Connected

To the left of the signaling state icon, the CMU indicates the forward and reverse radio configuration *(RC <F-RC>/<R-RC>),* the modulation scheme *(O-QPSK* or *HPSK),* and the selected service option (SO). If the radio configuration is incompatible with the selected modulation scheme, or if a modulation scheme is not supported by the mobile under test, it appears on a red background.

Configurations

The CMU offers a wide range of settings for the signal generator and analyzer, the signalling procedures, and the individual measurements. Configurations may apply to a whole function group (*Connection Control)* or to a particular measurement; see *Measurement Environments* on p. 3.4 ff.

Connection Control The *Connection Control* softkey is located on the right side of the title bar of each main and measurement menu. Depending on the mode (non-signalling or signalling), it opens a popup menu with tabs configuring the following:

- The signal generators and analyzers of the instrument *(Analyzer* and *Generator* in Non Signalling, *MS Signal* and *BS Signal* in Signalling mode)
- The CMU receiver settings and input path configuration (included in *Analyzer, MS Signal)*
- The trigger settings (included in *Analyzer, MS Signal)*
- The RF connectors to be used and the external attenuation *(RF Input/Output)*
- The reference signal and the system clock *(Sync.)*
- In *Signalling* mode, all actions changing the CMU's signalling state *(Connection)*
- In *Signalling* mode, a handover *(Handover)* to another network
- In *Signalling* mode, parameters of the network and the mobile station under test *(Network)*

All settings made in the *Connection Control* menu apply to the whole function group. Many of them are suspended, however, by measurement-specific parameters while a measurement is active (see section *Measurement Environment* in Chapter 4).

Configurations of measurements A popup menu offering specific settings is assigned to each measurement group *(Power, Modulation, Code Domain Power, and Receiver Quality).* The following parameters can be defined for many measurements:

- The repetition mode, the stop condition, the statistic count and the display mode for the measurement *(Control)*
- Tolerances for the measured quantities *(Limits, Limit Lines)*

These settings are explained in more detail section *General Settings* on page 3.6).

Configuration via hotkeys The softkeys and associated hotkeys in the graphical measurement menus provide the most important configurations for the current measurement (refer to Chapters 3 and 4 of the CMU Operating manual). Settings made via hotkeys supersede the corresponding settings found in the measurement configuration menu.

Measurement Environments

In *Signalling* mode, an independent set of measurement parameters can be defined for each CDMA2000 measurement group. The parameter sets form measurement *environments* that are activated as soon as a connection is established and the measurement is switched on. Only one measurement environment is active at any given time. When the connection is released, or when no measurement is active, the environment defined by the *Connection Control* parameters is used.

If all measurements contained in one environment (for example in the *Overview* menu, *Overview H-PSK* and *Channel Quality)*, are turned off while the connection is still established with a mobile station, the CMU reverts to using the *Connection Control* parameters. The *Output Power* displayed in *Connection Control* always reflects the current status of the total CMU output power. The measurement environment (and available measurements) is dependent on several settings in the *Connection Control* environment.

It is possible to partially or completely disable the mechanism of swapping environments:

- In the *Control* tab of the measurement configuration menus, *Environment Enable* enables or disables the environment of the corresponding measurement or measurement application.
- In the *Misc.* tab of the *Connection Control* menu, setting the *Use Measurement Environment* parameter to *All Off* disables all measurement environments so that the *Connection Control* parameters are used permanently. *Some On* is indicated if some but not all of the individual measurement environments have been enabled.

Measurement Groups

Measurement results are indicated in two different ways:

- Discrete values and parameters are displayed in output fields, lists and tables. In remote control, these results are referred to as scalars.
- Measurement curves (traces) are displayed in a Cartesian coordinate system, the time forming the x-axis scale. Relatively small sets of test points are generally viewed in a bar graph. In remote control, results of this type are referred to as arrays.

While the measurement is running in repetition mode *continuous* (see page 3.6), the indicated results are constantly updated. As shown in the table below, some of the measurement groups are different for the two test modes.

Table 3-1: Measurement Groups in the Signalling and Non-Signalling Mode

Non-Signalling	**Signalling**
Analyzer/Generator Shows the settings for the signals generated and analyzed by the instrument and presents an overview of the basic scalar power and modulation results.	**Overview** Shows the settings for the traffic channel and speech mode and presents an overview of the basic scalar power and modulation results. The receiver parameters and various signalling parameters reported by the mobile station are displayed.
	Power The open loop time response and gated output are shown as a trace plotted over time. Single points of the trace may be evaluated by means of graphical tools (markers and display line). The power output (minimum and maximum) of the mobile station is measured.
	Modulation Shows the error vector magnitude, magnitude error and phase error of the transmitted waveform interval as a function of time. The carrier feedthrough, I/Q imbalance, frequency error, transmission time error, waveform quality and MS power error are displayed.
	Code Domain Power The CMU measures the power of the mobile station's channels.
	Receiver Quality Shows the settings and results of the frame error rate test and forward power control reported by the mobile station.

General Settings

A number of settings can be made in several of the configuration menus assigned to the measurement groups *Analyzer/Generator, Overview, Power, Modulation, Code Domain Power* and *Receiver Quality*. In combination, these settings define the scope of the measurement, i.e. the number of waveform intervals measured and the results displayed. The following brief overview is intended to avoid confusion of terms.

Application

Applications are different measurements belonging to the same measurement group. They effectively split up a measurement group into various related subgroups which can be configured separately.

They are selected via the *Application* softkey in the measurement menus.

Statistic Count / Statistics Cycle

The statistic count is equal to the integer number of evaluation periods which form one statistics cycle. An evaluation period corresponds to the duration of a waveform interval (all TX measurements) or a frame (measurement group *Receiver Quality)*. Depending on the *repetition mode* (see below), a measurement may extend over one or several statistics cycles.

The *statistic count* is set in the *Control* tab of the configuration popup menus assigned to each measurement group.

Repetition Mode

The *repetition mode* defines how many statistics cycles are measured if the measurement is not stopped by a limit failure (see stop condition *On Limit Failure* below). Two modes are available for all measurements:

Single Shot	The measurement is stopped after one statistics cycle
Continuous	The measurement is continued until explicitly terminated by the user; the results are periodically updated

A third repetition mode is available in remote control:

Counting	Repeated single shot measurement with a fixed number of statistics cycles

The *repetition mode* is set in the *Control* tab of the configuration popup-menus assigned to the individual measurement groups.

Note: *In contrast to other measurement settings, thee repetition modes in manual and remote control are independent and do not overwrite each other. In most measurements, the default repetition mode in manual control is* Continuous *(observe results over an extended period of time), the default mode in remote control is* Single Shot *(perform one measurement and retrieve results).*

Stop Condition

For all TX measurements, two stop conditions can be selected:

None	The measurement is performed according to its repetition mode, regardless of the measurement results,
On Limit Failure	The measurement is stopped as soon as one of the limits is exceeded, regardless of the repetition mode set. If no limit failure occurs, it is performed according to its repetition mode.

For *Receiver Quality* measurements, the stop condition *None* (see above) and three further conditions can be selected:

Confidence Limit exceed.	The measurement is stopped as soon as the limit for the confidence level is exceeded

Frame Limit exceed.	The measurement is stopped as soon as the limit for the frame errors is exceeded
Any Limit exceed.	The measurement is stopped if either the confidence limit or the frame limit is exceeded.

The *Stop Condition* is set in the *Control* tab of the configuration popup-menus assigned to each measurement group.

Display Mode

In graphical measurement diagrams, the *Display Mode* defines which of the measured and calculated traces is displayed if the measurement extends over several waveform intervals. In general, traces are evaluated at a set of fixed, equidistant test points (samples). After n waveform intervals, n measurement results per test point have been taken. After a single shot measurement extending over c waveform intervals, c measurement results per test point have been taken.

Current	The current waveform interval, i.e. the last result for all test points, is displayed.
Minimum	At each test point, the minimum value of all waveform intervals measured is displayed.
Maximum	At each test point, the maximum value of all waveform intervals measured is displayed.
Max./Min.	At each test point, the extreme value of all waveform intervals measured is displayed, i.e. the maximum or minimum, whichever has a larger absolute value.
Average	At each test point, a suitably defined average over all waveform intervals measured is displayed; see paragraph on *Calculation of average quantities* below.

Note the difference in the calculation of *Average* on one hand, *Minimum, Maximum* and *Max./Min.* on the other hand, if the measurement extends over more than one statistic count (repetition mode *Continuous,* measurement time longer than one statistic count).

After evaluation of the different traces, the waveform interval power is logarithmized and plotted in a semi-logarithmic diagram.

The *Display Mode* is set in the *Control* tab of the configuration popup-menus assigned to the individual measurement groups.

Calculation of average quantities

The *Average* traces in the *Power, Modulation,* and *Spectrum* menus are obtained as follows:

Let c be the number of waveform intervals forming one statistics cycle (one *Statistic Count)* and assume that n waveform intervals have been measured since the start of the measurement. In calculating the *Average* trace, the following two situations are distinguished:

$n \leq c$ Single shot measurement or continuous measurement during the first statistics cycle: At each test point, *Average* trace no. n is calculated from *Average* trace no. n – 1 and *Current* trace no. n according to the following recurrence:

$$Avg(n) = \frac{n-1}{n} Avg(n-1) + \frac{1}{n} Curr(n) \qquad (n = 1, \ldots, c)$$

The *Average* trace represents the arithmetic mean value over all n waveform intervals measured.

n > c Continuous measurement after the first statistics cycle: At each test point, *Average* trace no. n is calculated from *Average* trace no. n – 1 and *Current* trace no. n according to:

$$Avg(n) = \frac{c-1}{c} Avg(n-1) + \frac{1}{c} Curr(n) \qquad (n > c)$$

Scalar quantities are averaged in analogy to *Average* traces. The formulas hold for n = 1 where the average trace becomes equal to the current trace (statistics off).

Calculation of statistical quantities

In *Power* and *Modulation* measurements the statistical functions *Average, Minimum, Maximum* and *Minimum/Maximum* are applied to a set of test points depending on two independent parameters:

- The time, i.e. the abscissa values t_i, i ranging from 1 to the total number of test points comprising the trace.
- The waveform interval number ranging from 1 to the number n of the current waveform interval.

The result of the statistical operations depends on the parameter range considered and – in the case of statistics functions evaluated over several parameters – on the order of evaluations. This is why the definition of statistical quantities deserves some attention and is explained in the relevant sections in chapter 4. Some particular examples are:

1. In the *Power* menu, application *Gated Output,* the quantity *Mean Output* denotes the average power of the current power control group. i.e. the arithmetical mean value of all test points t_i located in the power control group.
2. In the *Modulation* menu quantities such as the *Frequency Error*, *Phase Error RMS, Phase Error Peak* etc. are first calculated for the current waveform interval and entered in the *Current* column of the output table. The results in the *Minimum/Maximum* column correspond to the extreme value of the *Current* results calculated over all waveform intervals measured. The results in the *Average* column correspond to the average of the *Current* results calculated according to the prescription in paragraph *Calculation of average quantities* above.

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4 Functions and their Application

This chapter explains in detail all functions for the measurement of mobile stations supporting the CDMA2000 standard. The CMU 200 with Options K83, K84, K85, and/or K86 support the networks listed in Table 1-1 (see Chapter 1).

Note: *The menus for all CDMA2000 options and function groups are analogous. The tests and screen shots presented in the manual are valid for all function groups.*

The chapter is divided in two sections corresponding to the two function groups for module tests *(Non-Signalling)* and for mobile tests *(Signalling)*. Within the two sections, the discussion is structured according to the provided measurements and configurations. In contrast to chapter 6, *Remote Control – Commands,* general measurement configurations are relegated to the end of each section.

The description of each softkey, select or input field is followed by the corresponding remote-control command(s). Similarly, the description of the commands in chapter 6 also contains the corresponding menus of the user interface.

Each menu and each panel is briefly described first and then illustrated together with its call button. The menu functions are explained according to the following scheme:

Softkey Short function definition

Designation of select/input field

Definition of function.

Further description of the function: purpose, interaction with other settings, notes...

Parameter 1	Description of parameter 1
Parameter 2	Description of parameter 2

Further description of the parameters: purpose, interaction with other settings, notes...

Remote control

```
Remote-control command (long form)  Parameter1 | Parameter2
...
```

Note: *For all numerical values, including their ranges and default settings, please refer to the description of the remote-control commands in Chapter 6. The description of the operating concept is found in Chapter 3 of the CMU200 operating manual.*

CDMA Module Tests (Non-Signalling Mode)

The structure of this section is based on the configuration and measurement groups defined in the function group *IMT-2000 Mobile Station, Non-Signalling* mode. The menus are described in the following order:

- Measurement menu (*Analyzer/Generator*): Description of measurement menu, results, and specific measurement settings
- Common settings for the function group *(Connection Control)*

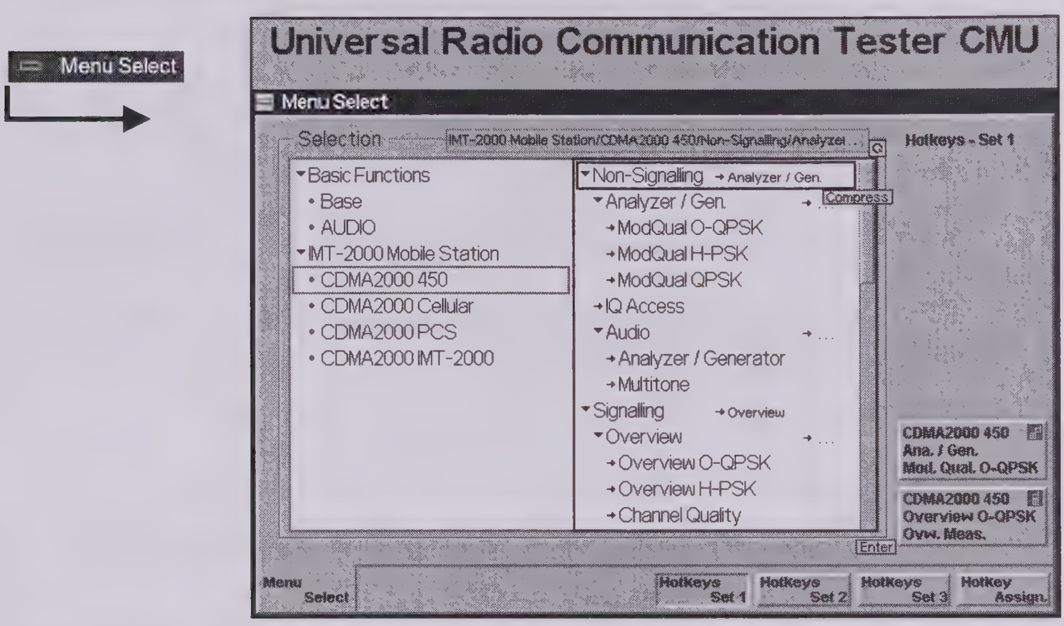


Figure 4-1 Menu Select

Analyzer/Generator

The *Analyzer/Generator* menu configures the signals of the RF generator and analyzer. At the same time, it controls the *Modulation* measurement and displays the current results.

To remain compatible with multiple mobile stations, the CMU200 supports several modulation schemes, to be selected as *Applications*.

O-QPSK	Supports cdmaOne connections (radio configurations 1 and 2)
H-PSK	Supports CDMA2000 connections (radio configurations 3 and 4)
QPSK	Supports CDMA2000 connections with only a Pilot channel.

Note: *The screen shots provided for the Analyzer/Generator non-signalling mode were taken with the CMU200 set to the O-QPSK modulation scheme. The menus for the modulation schemes H-PSK and QPSK are analogous.*

In the softkey bar on the right side, the *Analyzer/Generator* menu provides different types of softkeys:

- The measurement control softkey *Mod. Qual. O-QPSK* changes to *Mod. Qual. H-PSK* or *Mod. Qual. QPSK*, depending on the application selected. This softkey controls the measurement, indicates its status *(RUN | HLT | OFF)* and opens the configuration menu *Modulation Quality Configuration*. The hotkeys associated to the measurement control softkey define the scope of the *Modulation* measurement.

- The other softkeys on the right side are combined with various hotkeys (e.g. the hotkeys *RF Max. Level* and *RF Mode* belong to the softkey *Analyzer Level).* The softkey/hotkey combinations provide test settings and switch over between different measurements.

Types of settings

The purpose of the *Analyzer/Generator* menu is to provide quick access to the most common *Modulation* measurements and to present the basic measurement results at a glance. The three measurement applications *Mod. Qual. O-QPSK, Mod. Qual. H-PSK* and *Mod. Qual. QPSK* can be selected with the *Application* softkey. The remaining softkeys/hotkey combinations provide two different types of settings:

- Common settings are valid for all applications of function group *CDMA2000 Non Signalling.* Changing common settings in any application will have an impact on all measurements and applications of the function group. All common settings are also provided in the *Connection Control* menu (see p. 4.16 ff.). Examples of common settings are the RF input level and trigger settings (softkey *Analyzer Level)* and the configuration of the RF generator (softkey *Generator)*.
- Specific settings are relevant for one application only, or they can be set independently for several applications. Changing specific settings in an application will not affect the other measurements and applications of the function group. No specific settings are provided in the *Connection Control* menu (see p. 4.16 ff.). Examples of specific settings are the *Repetition* mode (to be set independently for all applications providing this mode).
- In *Signalling* mode each measurements has its own test setup environment. The parameters in the *Connection Control* menu do not provide common settings in the sense described above. Refer to section *Measurement Environment (Parameter Settings)* and to the introduction to each measurement.

Measurement results

The output fields in the left half of the *Analyzer/Generator* menu show the current measurement results. The results depend on the selected application. They are described in detail in section *Measurement Results* on p. 4.6 f.

The results displayed in the *Analyzer/Generator* menu represent only a fraction of the modulation results that the CMU is able to acquire. A comprehensive set of test results is displayed in the *Modulation* measurement menus provided in *Signalling* test mode. In particular, the *Modulation* menus show many quantities as functions of time.

The *Analyzer/Generator* menu is opened from the *Menu Select* menu (with associated key at the front of the instrument). The hotkeys associated to the *Menus* softkey switch over between the *Analyzer/Generator* menu and the remaining measurement menus of function group *CDMA2000 Non Signalling.*

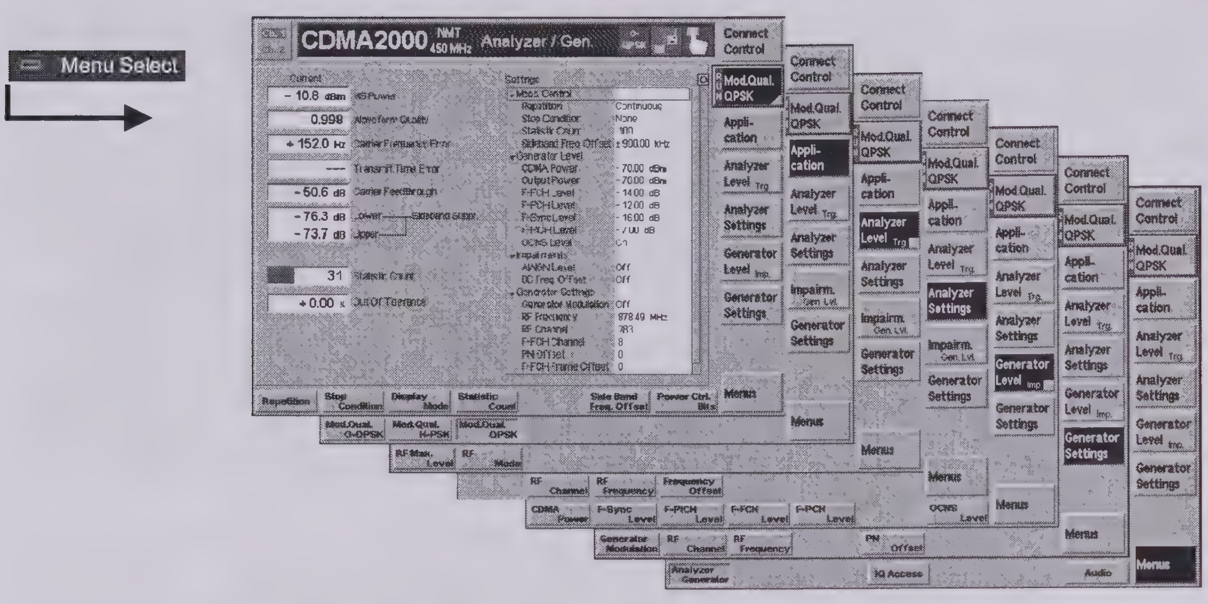


Figure 4-2 Measurement menu Analyzer / Generator

Softkey Selections

The softkeys on the right side of the menu control the measurement, select the application and provide application-specific settings.

Measurement Control

Each *Analyzer/Generator* application is controlled by means of the measurement control softkey below the *Connect. Control* softkey and the associated hotkeys.

Mod. Qual. O-QPSK

The *Mod. Qual. O-QPSK* softkey (which changes to *Mod. Qual. H-PSK* or *Mod. Qual. QPSK,* depending on the application selected) controls the *Modulation* measurement and indicates its status *(RUN | HLT | OFF)*. To change the status, press the *Modulation* softkey once and then use the front panel keys *ON/OFF* or *CONT/HALT*.

Pressing the *Modulation* softkey twice (once if already selected) opens the *Modulation Configuration* popup menu (see section *Measurement Configurations (Modulation Configuration)* on p. 4.7 ff.).

Remote Control

```
INITiate:MODulation:MQUality:<Application>
ABORt:MODulation:MQUality:<Application>
STOP:MODulation:MQUality:<Application>
CONTINUE:MODulation:MQUality:<Application>
FETCh:MODulation:MQUality:<Application>:STATus?
```

Measurement configuration

Pressing the *Modulation* softkey twice (once if already selected) opens the *Modulation Configuration* popup menu (see page 4.7). Besides, the measurement control softkey provides hotkeys to define the scope of the measurement. All these settings are also provided in the configuration menu and described in more detail in section *Measurement Control (Modulation Configuration – Control)* on page 4.8 ff.

Selecting the Application

Appli-cation

The *Application* softkey selects the measurement application. The measurement control softkey (second softkey below *Connect. Control)* indicates the current application. The corresponding measurement results are explained in section *Measurement Results* on page 4.6 ff.

Mod. Qual. 0-QPSK

The *Mod. Qual. O-QPSK* hotkey selects the modulation measurement on O-QPSK Offset Quadrature Phase Shift Keying) modulated signals. This modulation scheme is used for cdmaOne connections (radio configurations 1 and 2).

Remote control
The *Mod. Qual. O-QPSK* application is selected by the keyword `OQPSk` in the 4th level of the `MODulation` commands, e.g.
`CONFigure:MODulation:MQUality:OQPSk...`

Mod. Qual. H-PSK

The *Mod. Qual. H-PSK* hotkey selects the modulation measurement on H-PSK (Hybrid Phase Shift Keying) modulated signals. This modulation scheme is used for CDMA2000 connections (radio configurations 3 and 4).

Remote control
The *Mod. Qual. H-PSK* application is selected by the keyword `HPSK` in the 4th level of the `MODulation` commands, e.g.
`CONFigure:MODulation:MQUality:HPSK...`

Mod. Qual. QPSK

The *Mod. Qual. QPSK* hotkey selects the modulation measurement on QPSK (Quadrature Phase Shift Keying) modulated signals. This modulation scheme is used for CDMA2000 connections with only a pilot channel.

Remote control
The *Mod. Qual. QPSK* application is selected by the keyword `QPSK` in the 4th level of the `MODulation` commands, e.g.
`CONFigure:MODulation:MQUality:QPSK...`

Common settings

As outlined in section *Analyzer/Generator on p.* 4.2 ff., some of the hotkey/softkey combinations in the *Analyzer/Generator* menu are valid irrespective of the application. These common settings are also provided in the *Connection Control* menu; for a detailed description refer to p. 4.16 ff.

Softkeys

- The *Trigger/Analyzer Level* softkey defines the trigger settings for the measurements and controls the level in the RF signal path. The settings are provided in the *Trigger* and *Analyzer* tabs of the *Connection Control* menu; see sections *Trigger (Connection Control – Trigger)* on p. 4.28 ff. and *Analyzer Control (Connection Control – Analyzer)* on p. 4.17 ff.
- The *Analyzer Settings* softkey defines the center frequency of the RF analyzer. The settings are provided in the *Analyzer* tab of the *Connection Control* menu; see section *Analyzer Control (Connection Control – Analyzer)* on p. 4.17 ff.
- The *Impairment/Generator Level* softkey defines the levels in all physical channels of the generated forward CDMA signal and configures an additive noise signal. The settings are provided in the *Generator* tab of the *Connection Control* menu; see section *Generator Control (Connection Control – Generator)* on p. 4.18 ff.

- The *Generator Set./P. Ctrl* softkey defines the frequency of the generated forward CDMA signal, its modulation and an offset of the PN sequence. In addition, it defines the power control bits sent to the MS to control it output power *(Power Control)*. The settings are provided in the *Generator* tab of the *Connection Control* menu; see section *Generator Control (Connection Control – Generator)* on p. 4.18 ff.

Settings table

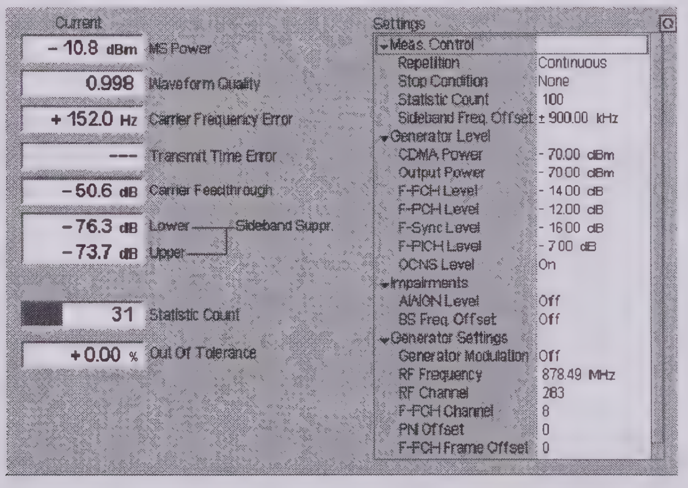
The *Settings* table in the right half of the *Analyzer/Generator* menu gives an overview of the measurement settings of the current application as defined by means of the softkey/hotkey combinations or in the configuration menus. It changes when a different application is selected. The roll-key scrolls and expands the *Setup* table.

Measurement Results

The results displayed in the *Analyzer/Generator* menu are analogous in all three applications. They are displayed in various output fields in the left half of the measurement menu. The display mode *(Current, Min./Max.* or *Average)* is displayed above the output fields.

Display mode

Output fields



Current

- 10.8 dBm MS Power
0.998 Waveform Quality
+ 152.0 Hz Carrier Frequency Error
--- Transmit Time Error
- 50.6 dB Carrier Feedthrough
- 76.3 dB Lower — Sideband Suppr.
- 73.7 dB Upper
31 Statistic Count
+ 0.00 % Out Of Tolerance

Settings

Meas. Control
Repetition Continuous
Stop Condition None
Statistic Count 100
Sideband Freq. Offset ± 900.00 kHz
Generator Level
CDMA Power - 70.00 dBm
Output Power - 70.00 dBm
F-FCH Level - 14.00 dB
F-PCH Level - 12.00 dB
F-Sync Level - 16.00 dB
F-PICH Level - 7.00 dB
OCNS Level On
Impairments
AWGN Level Off
BS Freq. Offset Off
Generator Settings
Generator Modulation Off
RF Frequency 878.49 MHz
RF Channel 283
F-FCH Channel 8
PN Offset 0
F-FCH Frame Offset 0

Figure 4-3 Display of results (Analyzer/Generator)

Filter settings for power measurements

The CMU measures and displays different power results, acquired with different measurement methods.

Most of the power measurements are performed using the baseband receiver filter specified in standard TIA/EIA/IS-2000.2-A. In particular, this holds for *MS Power* displayed in the *Analyzer/Generator* menu. In *Non Signalling* mode, the power results listed in the table below are obtained with different measurement filters.

Table 4-1 Filer settings for power measurements (Non Signalling)

Value	Menu	Filter
Wideband Power	Connection Control, AF/RF ⊖• (see p. 4.26)	Wideband measurement
Sideband Suppression	Analyzer/Generator, see below.	30 kHz (Gaussian) spectrum analyzer filter

MS Power

MS Power is the total transmitted power level from the mobile station. The MS power is measured at the analyzer frequency *(RF Frequency,* typically set to the carrier frequency) using the receiver filter specified in standard TIA/EIA/IS-2000.2-A.

In addition the *MS Power*, the CMU measures the power at an offset frequency from the carrier; see *Sideband Suppression* below.

Waveform Quality

Waveform Quality is the modulation accuracy of the transmitted signal. The waveform quality is obtained by comparing the transmitted signal to an ideal signal as defined in standard TIA/EIA-98.

Carrier Frequency Error

Carrier Frequency Error is the difference between the nominal frequency of the selected channel and the measured frequency.

Transmit Time Err.

Transmission Time Error is the time offset between the mobile station's signal and the CMU's signal.

Carrier Feedthrough

Carrier Feedthrough refers to the origin offset, which is the magnitude of the RF carrier relative to the magnitude of the modulated carrier.

Sideband Suppression

Sideband Suppression is a power measurement at a user–configurable offset frequency used for spurious measurements. In contrast to the *MS Power* the sideband suppression is measured with a 30 kHz (Gaussian) spectrum analyzer filter. The frequency offset is set via the *Side Band Freq. Offset* hotkey associated to the measurement control softkey.

Lower Sideband Suppr.	Ratio of the sideband power at *RF Frequency – Side Band Freq. Offset* to the *MS Power* in dB
Upper Sideband Suppr.	Ratio of the sideband power at *RF Frequency + Side Band Freq. Offset* to the *MS Power* in dB

Note: *In remote control the lower and upper sideband suppression can be measured at up to 4 different frequencies; see keywords* `...ACP1` *to* `...ACP4`.

Statistic Count

Number of waveform intervals per statistics cycle. The colored bar indicates the relative measurement progress in the statistics cycle.

Out of Tolerance

Out of Tolerance is the percentage of waveform intervals that exceed the defined limits.

Remote control

```
READ[:SCALar]:MODulation:MQUality:<Application>?
FETCh[:SCALar]:MODulation:MQUality:<Application>?
SAMPle[:SCALar]:MODulation:MQUality:<Application>?
```

Measurement Configurations (Modulation Configuration)

The popup menu *Modulation Configuration* contains three tabs to determine the parameters controlling the Modulation measurement including the error tolerances.

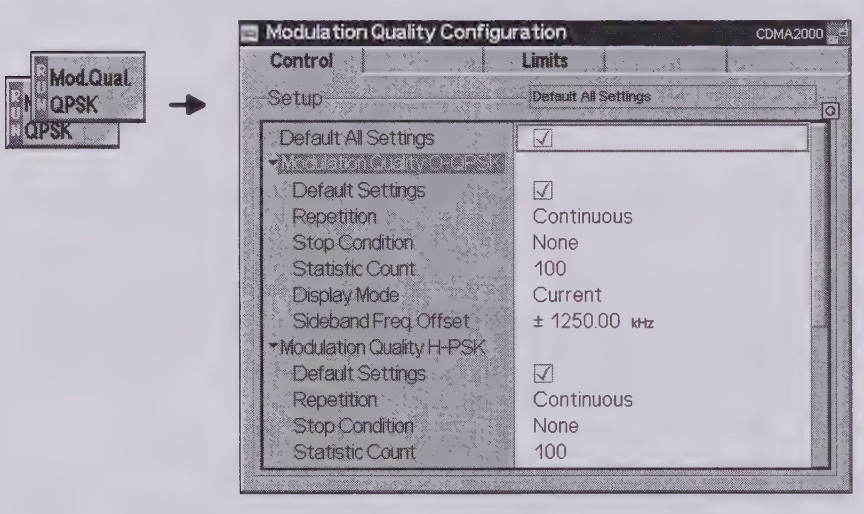
The popup menu *Modulation Configuration* is activated by pressing the measurement control softkey at the top right in the graphical measurement menu *Modulation* twice. It is possible to change between the tabs by pressing the associated hotkeys.

Measurement Control (Modulation Configuration – Control)

The *Control* tab controls the Modulation measurement by determining

- The *Repetition* mode
- The *Stop Condition* for the measurement
- The type of result displayed *(Display Mode)*
- The number of waveform intervals/evaluation periods forming a statistics cycle *(Statistic Count)*
- The frequency offset used for the sideband suppress power measurement *(Sideband Freq. Offset)*

Besides, it configures the graphical diagrams by adding or removing the *Grid*.



Default All Settings ☑
Modulation Quality O-QPSK
Default Settings ☑
Repetition Continuous
Stop Condition None
Statistic Count 100
Display Mode Current
Sideband Freq. Offset ± 1250.00 kHz
Modulation Quality H-PSK
Default Settings ☑
Repetition Continuous
Stop Condition None
Statistic Count 100

Fig. 4-4 Modulation Configuration – Control

The power control settings are valid for all measurements. The remaining settings can be defined independently for the different applications of the *Analyzer/Generator* measurement group *(Modulation Quality O-QPSK, Modulation Quality H-PSK, Modulation Quality QPSK)*.

Default Settings	The *Default All Settings* switch assigns default values to all settings in the *Control* tab (the default values are quoted in the command description in chapter 6 of this manual). In addition, default switches for the individual applications are provided. Remote control `DEFault:Modulation:MQUality:CONTrol ON	OFF` `DEFault:Modulation:MQUality[:OQPSk]:CONTrol ON	OFF` etc.

Repetition The *Repetition* parameter defines how often the measurement is repeated:

Single Shot	Single-shot measurement: the measurement is stopped after a statistics cycle (or after a stop condition is met, see below). A stopped measurement is indicated by the status display *HLT* in the *Modulation* softkey. Unless otherwise stated, a statistics cycle corresponds to the number of waveform intervals/evaluation periods set under *Statistic Count*.
Continuous	Continuous measurement: The CMU continues the measurement until it is terminated explicitly (or until the stop condition for the measurement is met, see below). The measurement results are valid after one statistics cycle; however, the measurement is

continued, and the output is continuously updated. An ongoing measurement is indicated by the status display *RUN* in the softkey *Modulation*.

Single shot should be selected if only a single measurement result is required under fixed conditions. The continuous measurement is suitable for monitoring the evolution of a measured quantity in time, for example for adjustments.

Note: *In remote mode, the counting measurement (counting mode) is available as a further measurement mode with a defined number of measurement cycles to be performed, see chapter 6 of this manual. The Stop Condition setting can affect the Single Shot and Continuous repetition modes.*

Remote control

```
CONFigure:MODulation:MQUality[:OQPSk]:CONTrol
CONFigure:MODulation:MQUality:HPSK:CONTrol
CONFigure:MODulation:MQUality:QPSK:CONTrol
         CONTinuous | SINGleshot | 1 ... 10000,<StopCondition>,
                                          <Stepmode> etc.
```

Stop Condition

The *Stop Condition* field defines a stop condition for the measurement:

NONE	Continue measurement irrespective of the results of the limit check
On Limit Failure	Stop measurement as soon as the limit check fails (one of the tolerances is exceeded)

The *Stop Condition* setting is valid for both the *Single Shot* and *Continuous* repetition modes.

Remote control

```
CONFigure:MODulation:MQUality[:OQPSk]:CONTrol
CONFigure:MODulation:MQUality:HPSK:CONTrol
CONFigure:MODulation:MQUality:QPSK:CONTrol
          <Repetition>,SONerror | NONE, <Stepmode> etc.
```

Display Mode

The *Display Mode* field defines which of the four measured and calculated statistical measurement results is displayed. The measurement results differ in the way the waveform interval Modulation *p(t)* at a fixed point in time *t* is calculated if the measurement extends over several waveform intervals; see section *Common Settings* in Chapter 3:

Current	Measured value for current waveform interval
Minimum/Maximum	Extreme value of a number of waveform intervals
Average	Average value over a number of waveform intervals

The number of waveform intervals for calculation of the statistical values *Minimum/Maximum* and *Average* – and thus the result – depends on the repetition mode set. In detail, this implies:

Single shot	Display of minimum/maximum and average value from the performed statistics cycle.
Continuous	Display of minimum/maximum from all waveform intervals already measured. The **average value**, however, is calculated according to the rule in Chapter 3, section *General Settings*.

Remote control
no display mode set, the `READ...`, `FETCh...` and `SAMPle` commands retrieve all values.

Statistic Count

The input field *Statistic Count* defines the length of the statistics cycles in waveform intervals.

The settings *1* and *OFF* (press *ON/OFF* key) are equivalent. A statistics cycle determines the duration of single-shot measurements.

Remote control
`CONFigure:MODulation:MQUality[:OQPSk]:CONTrol`
`CONFigure:MODulation:MQUality:HPSK:CONTrol`
`CONFigure:MODulation:MQUality:QPSK:CONTrol`
`<Statistics>, <Repetition>, <Stop Cond>, <Step Mode>`

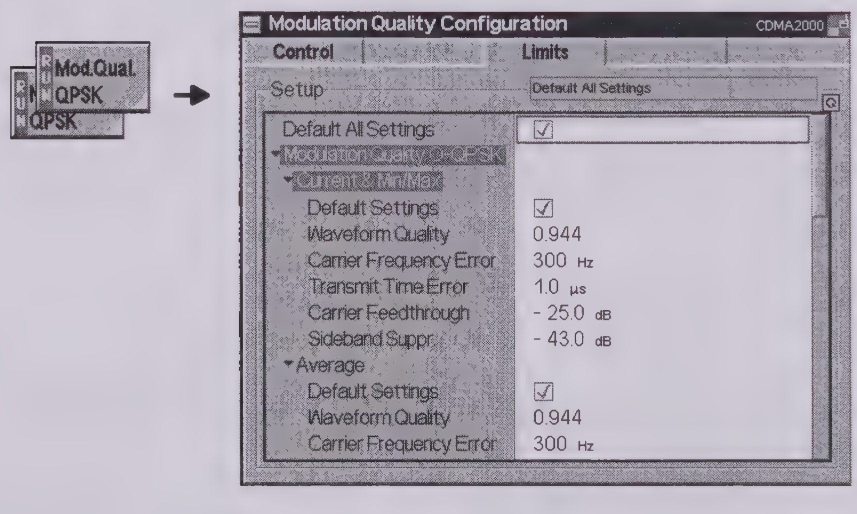
Side Band Freq. Offset

The *Side Band Freq. Offset* input field sets the frequency offset used for the *Sideband Suppression* power measurement; see section *Measurement Results* on p. 4.1 ff. The sideband suppression is measured at the two offset frequencies symmetrical to the *RF Frequency* (lower and upper sideband suppression).

In remote control up to 4 different frequency offsets can be defined so that up to 8 symmetrical sideband suppression values are available:
`CONFigure:MODulation:MQUality:<Application>:CONTrol:FOFFset:SBSuppress:ACP<nr>`, where <nr> = 1 to 4

Modulation Configuration – Limits

The *Limits* tab defines upper and lower error limits for the measured values of all three *Modulation* measurement applications. The limits are set independently for the display modes *Current* and *Max./Min.* on one hand, *Average* on the other hand; see section *Measurement Control (Modulation Configuration – Control)* on p. 4.8 ff. All measured values are described in section *Measurement Results* on p. 4.6 ff.



Default All Settings ☑
Modulation Quality O-QPSK
Current & Min/Max
Default Settings ☑
Waveform Quality 0.944
Carrier Frequency Error 300 Hz
Transmit Time Error 1.0 µs
Carrier Feedthrough - 25.0 dB
Sideband Suppr. - 43.0 dB
Average
Default Settings ☑
Waveform Quality 0.944
Carrier Frequency Error 300 Hz

Figure 4-5 Modulation Configuration – Limits

Default All Settings

The *Default All Settings* switch assigns default values to all parameters of the *Limits* tab. The default values are quoted in the command description in chapter 6 of this manual. In addition, default switches for the individual applications and statistical modes are provided.

Remote control
`DEFault:MODulation:MQUality:LIMit ON | OFF`
`DEFault:MODulation:MQUality:<Application>:CMMax:LIMit`
`DEFault:MODulation:MQUality:<Application>:AVERage:LIMit`

Current & Max/Min *Current and Max/Min* sets the limits for the measured values in the current waveform interval or of the extreme values of all measured waveform intervals *(Min/Max)*.

Remote control
`CONFigure:MODulation:MQUality:<Application>:CMMax:LIMit`

Average *Average* sets the limits for the average value of the measured values obtained according to the averaging rules of Chapter 3, section *General Settings.*

Remote control
`CONFigure:MODulation:MQUality:<Application>:AVERage:LIMit`

Power Measurements

The main menu *Power* determines the power of the received RF signal.

- The measurement control softkey *NPower* controls the measurement, indicates its status *(RUN | HLT | OFF)* and opens the configuration menu *Power Configuration*. The hotkeys associated to the measurement control softkey define the scope of the *Power* measurement.
- The other softkeys on the right side are combined with various hotkeys (e.g. the hotkeys *RF Frequency* and *Frequency Offset* belong to the softkey *Analyzer Settings)*. The softkey/hotkey combinations provide test settings and switch over between different measurements.

Narrow band power

Narrow band power is the only application in the *Power* menu. The measurement yields the average, minimum and maximum power of an RF input signal in an evaluation period of variable length plus a statistical evaluation over several periods; see section *Measurement Results* on p. 4.13 ff. A fixed oversampling rate of 4 is used.

The measurement is performed with the receiver filter specified for CDMA conformance tests and at the frequency specified in the *Analyzer Settings*.

The main menu *Power* is opened from the main menu *Menu Select* (with associated key at front of instrument). It can also be accessed from the other measurement menus of the function group *RF* via the *Power* hotkey.

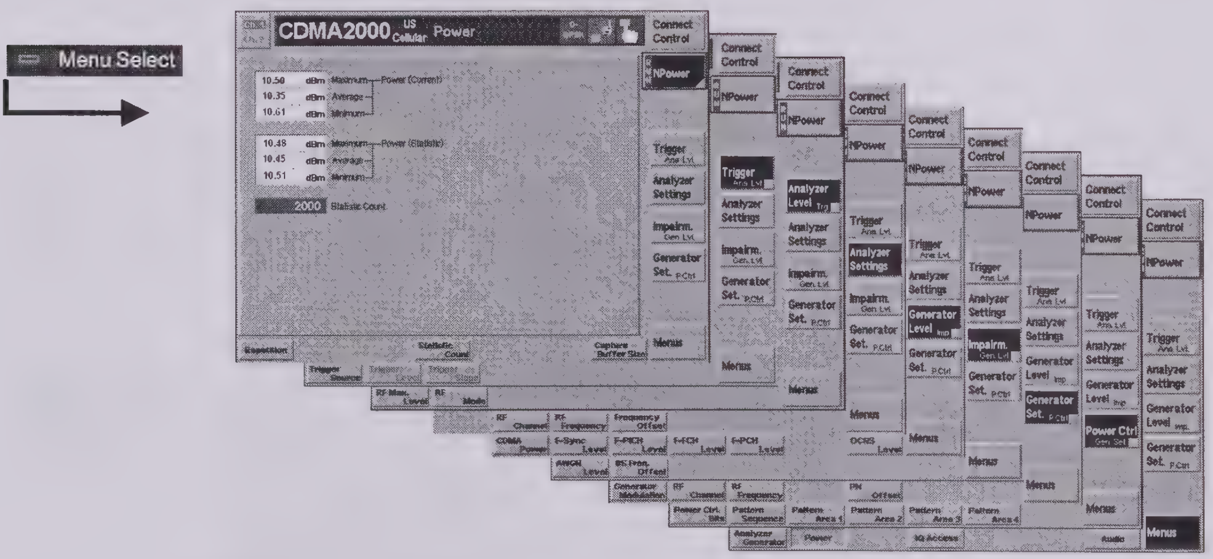


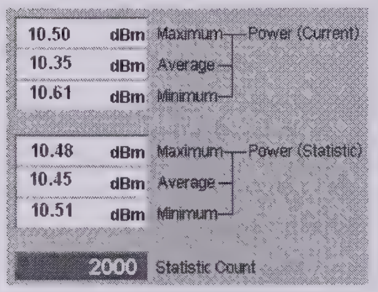
Fig. 4-6 Measurement menu Power

Test Settings

The *Power – NPower* measurement is controlled by means of the measurement control softkey below the *Connect. Control* softkey and the associated hotkeys. The properties of the measurement control softkeys are analogous in all measurements; see section *Measurement Control on p.* 4.4 ff; the hotkey functions are also provided in the *Control* tab of the *Power Configuration* menu; see section *Power Configuration* on p. 4.13 ff. The remaining softkeys provide common settings; see section *Common settings* on p. 4.5 ff. settings.

Measurement Results

The *Power – NPower* results are displayed in several groups of output fields. The statistical evaluation is based on a basic evaluation period which is given by the *Capture Buffer Size* and a fixed oversampling factor of 4 and on the statistics cycle *(Statistic Count)* defined in the configuration menu (see section *Power Configuration* on p. 4.13 ff.; for a general description of statistical evaluations in the CMU refer to Chapter 3, section *General Settings)*.



10.50 dBm Maximum – Power (Current)
10.35 dBm Average
10.61 dBm Minimum

10.48 dBm Maximum – Power (Statistic)
10.45 dBm Average
10.51 dBm Minimum

2000 Statistic Count

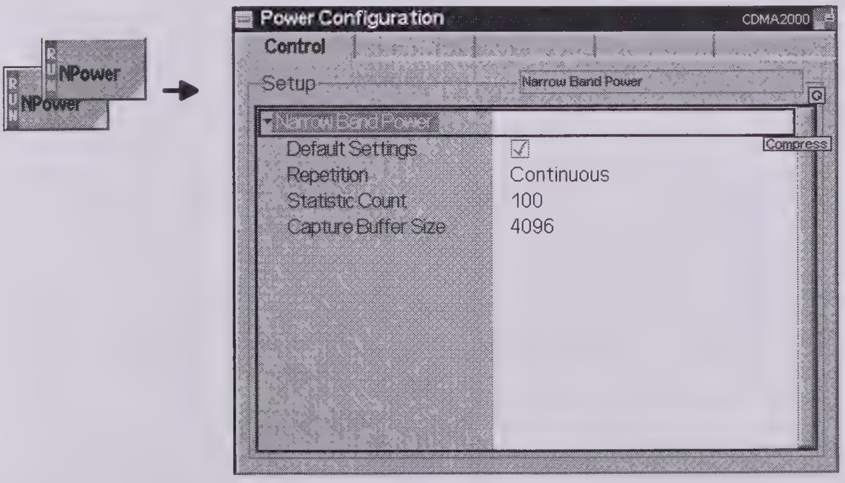
Power (Current)	Average, minimum and maximum power of the RF input signal in the current evaluation period.
Power (Statistic)	Average, minimum and maximum of the *Power (Current)* values: The *Maximum (Minimum)* value is the largest (smallest) power ever measured in the current measurement. *Average* is the average over all *Average – Power (Curr.)* values in the current measurement, obtained according to the averaging rules described in Chapter 3, section *General Settings.*
Statistic Count	Number of evaluation periods per statistics cycle. The colored bar indicates the relative measurement progress in the statistics cycle

Power Configuration

The popup menu *Power Configuration* configures the *Power – NPower* measurement. It is opened by pressing the *NPower* measurement control softkey in the *Power* menu twice.

The *Control* tab of the *Power Configuration* menu defines the scope of the measurement:

- The *Repetition* mode
- The *Statistic Count* for the measurement
- The number of samples per single shot *(Capture Buffer Size)*



Setup: Narrow Band Power

Narrow Band Power
Default Settings ☑
Repetition Continuous
Statistic Count 100
Capture Buffer Size 4096

Fig. 4-7 Power Configuration – Control

The *Repetition* and *Statistic Count* settings are analogous to the *Analyzer/Generator* menu; see section *Measurement Control (Modulation Configuration – Control)* on p. 4.8 ff. Note that the basic evaluation period for a single-shot measurement is given by the number of samples defined via *Capture Buffer Size.*

Default Settings

The *Default All Settings* switch assigns default values to all settings in the *Control* tab (the default values are quoted in the command description in chapter 6 of this manual).

Remote control
–

Capture Buffer Size

Capture Buffer Size specifies the number of samples acquired to calculate a single shot narrow-band power result *(Power (Current)* values in the measurement menu). A fixed oversampling factor of 4 is used so that the duration of the measurement interval (evaluation period) is proportional to the capture buffer size. The start of the measurement is determined by the trigger settings; with *Free Run* trigger, it is unsynchronized.

Increasing the number of samples slows down the measurement but may be necessary to obtain meaningful results, because CDMA2000 signals typically show rapid variations in time and a large crest factor.

Remote control
`CONFigure:NPOWer:CONTrol:CBSize`

IQ Access

The *IQ Access* menu controls the IQ Access Board and configures the RF generator signal while the board is used for measurements. The menu is available with option CMU-B82, *Access Board for CDMA Signalling Units CMU-B81 and CMU-B83*. The access board provides an interface to the CMU-B83 CDMA Signalling Unit. It can be used to

- Access the baseband digital Rx and Tx I/Q data and timing signals
- Use all of the CMU200's calibrated front end, attenuators, and measurement capabilities

For more information refer to the separate CMU-B82 operating manual, stock no. 1150.0299.32.

The *IQ Access* menu can be opened from the *Menu Select* menu (with associated key at the front of the instrument) or using the *IQ Access* hotkey associated to the *Menus* softkey in the other measurement menus of function group *CDMA2000 Non Signalling*. While *IQ Access* is active the CMU's RX and TX resources are reserved for access board applications so that the other measurements are suspended.

The access board can not be used in *Signalling* mode.

Audio Measurements

The menu group *Audio* comprises the functions for generating and measuring single or multitone audio signals. The menu group is available with option CMU-B41, *Audio Generator and Analyzer*. All *Audio* menus and remote-control commands are described in the CMU 200/300 operating manual.

The *Audio* option supports two independent test circuits. In *Non Signalling* mode the input and output connectors for both circuits are fixed; they are indicated in the *Audio* measurement menu. This test mode corresponds to the standalone audio tests described in the CMU 200/300 operating manual.

In Signalling mode, it is possible to send and receive audio data modulated onto the RF carrier and thus test the audio circuit of a connected mobile phone (see section *CDMA Measurements – AF/RF Connectors (Connection Control – AF/RF)).*

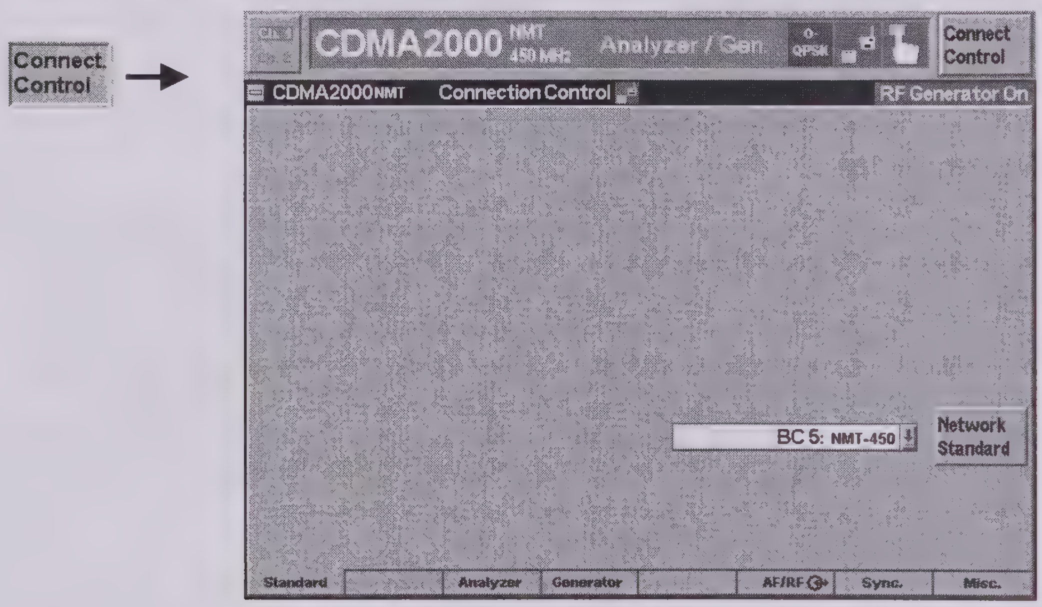
Connection Control

In *Non Signalling* mode, the *Connection Control* menu consists of tabs to configure the inputs and outputs of the CMU and the respective signals in the function group *CDMA2000 Non-Signalling,* define the network standard, the trigger settings and the routing of I/Q and IF signals.

The menu group is activated using the softkey *Connect Control* to the right of the header of the measurement menu. The individual tabs *(Standard, Analyzer, Generator, AF/RF ⊖, Sync., Trigger, I/Q-IF)* can be accessed using the hotkeys at the bottom of the screen.

Network Standard (Connection Control – Standard)

The popup menu *Standard* defines which network and standard is used for testing.



Network Standard: BC 5: NMT-450

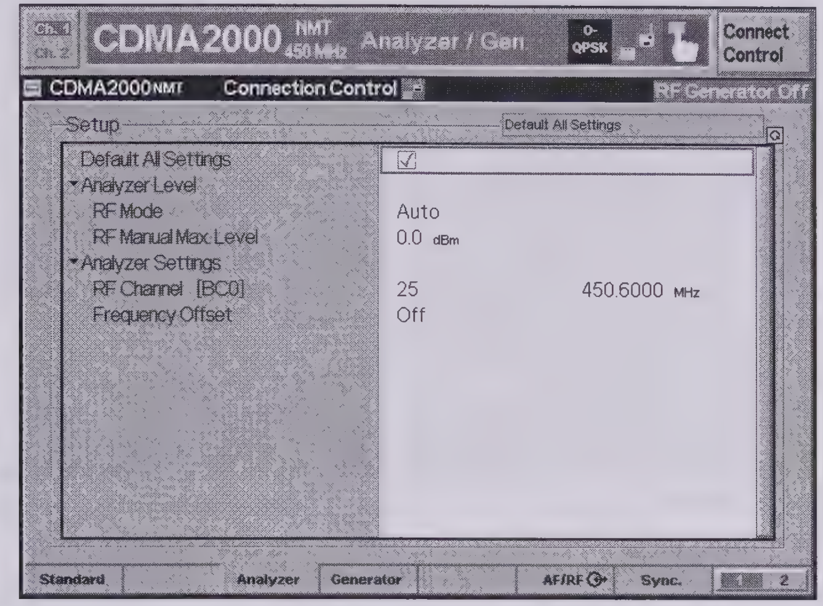
Figure 4-8 Connection Control – Standard

Refer to Table 1-1 in Chapter 1 for a list of the supported CDMA2000 networks.

Analyzer Control (Connection Control – Analyzer)

The *Analyzer* tab configures the RF input path by defining the analyzer level and frequency.

Connect Control →



Default All Settings ☑
Analyzer Level
RF Mode Auto
RF Manual Max Level 0.0 dBm
Analyzer Settings
RF Channel [BC0] 25 450.6000 MHz
Frequency Offset Off

Figure 4-9 Connection Control – Analyzer Settings

Default All Settings The *Default All Settings* switch assigns default values to all settings in the *Analyzer* tab (the default values are quoted in the command description in chapter 6 of this manual).

Remote control
`DEFault:RFANalyer`

Analyzer Level – RF Mode The *Analyzer Level* table section sets the maximum input level that can be measured. Two alternative *RF Modes* for defining this value are provided:

Manual	Manual input of maximum input level in the *RF Max. Level* field
Auto	Automatic setting of maximum input level *(autoranging)* according to the peak power (PEP) of applied signal

Remote control
`[SENSe:]LEVel:MODE MANual | AUTomatic`

Analyzer Level – RF Max. Level The maximum expected input level can be entered in the *RF Max. Level* input field. Input levels exceeding the *RF Max. Level* overdrive the input path and cause invalid results ("– – –").

Remote control
`[SENSe:]LEVel:MAXimum <Level>`

External input attenuation The range of *RF Max. Level* values depends on the RF input used. If an external input attenuation is reported to the instrument to compensate for a known path loss (see section *AF/RF Connectors (Connection Control – AF/RF)* on page 4.24), all levels measured are referenced to the output of the DUT and therefore shifted with respect to the actual level at the input connectors of the CMU. The level ranges for the input connectors are shifted as well.

Error messages

If the *RF Max. Level* is too high or too low, a window with the error message *"<Max_Level> is out of range. <permissible max. value> is limit."* and three fields will appear:

Accept	The permissible max. value is accepted as *RF Max. Level*,
Re-edit	*RF Max. Level* is entered once again,
Cancel	The last valid input value is maintained.

When switching over to another input, the current value of *RF Max. Level* is automatically adapted, if required:

- Towards lower values to the maximum value of the new input,
- Towards upper values to the minimum value of the new input.

Note: *A maximum input level can be entered even if automatic level setting (autoranging) is selected. The entered level is used as a start value for the autoranging routine and is also important to ensure safe switchover to manual setting.*

Analyzer Settings – RF Channel [<>]

RF Channel defines the base station channel number (and frequency) of the generated RF signal. The brackets contain the current bandclass of the selected network.

The default settings for the channel numbers depend on the network selected. Changing the *RF Channel* also changes the *RF Frequency* setting.

Table 1-1 in Chapter 1 lists the networks and standards supported by the CMU with the CDMA2000 options.

Remote control
`[SENSe:]RFANalyzer:FREQuency` *`<Frequency>`*

Frequency Offset

Frequency Offset determines a frequency offset to impair the RF analyzer signal.

Remote control
`[SENSe:]RFANalyzer:FOFFset <Analyzer Freq. Offset>`

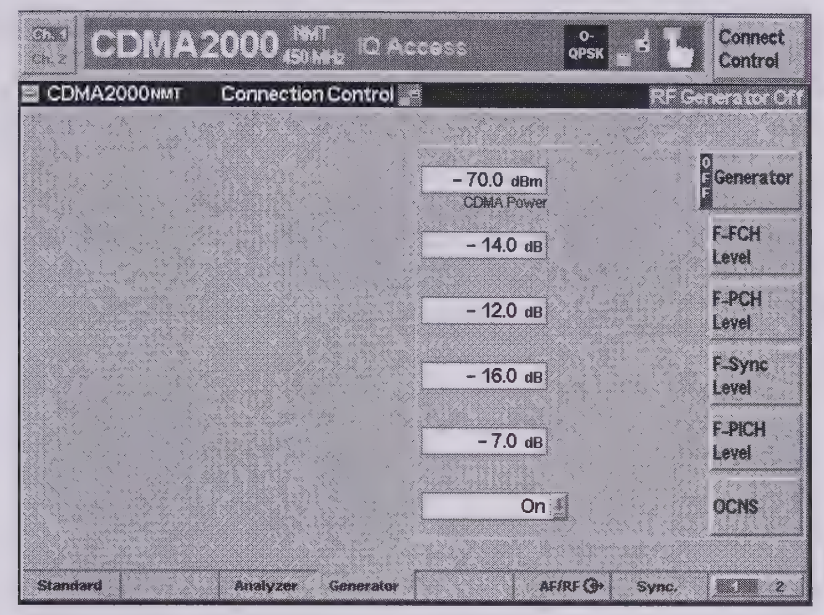
Generator Control (Connection Control – Generator)

The popup menu *Generator* configures the signals generated by the CMU. The CMU provides a softkey-oriented version of the *Generator* tab and a table-oriented version with extended functionality. The *Generator* hotkey toggles between the two versions if it is pressed repeatedly.

Softkey-Oriented Version

The softkey-oriented version of the *Generator* tab controls the RF generator and defines the level in all physical channels contributing to the generated forward CDMA signal.

Connect. Control →



Generator: – 70.0 dBm CDMA Power

F-FCH Level: – 14.0 dB

F-PCH Level: – 12.0 dB

F-Sync Level: – 16.0 dB

F-PICH Level: – 7.0 dB

OCNS: On

Figure 4-10 Connection Control – Generator (softkey)

Generator

The *Generator* softkey defines the generator level and indicates the operating status of the RF generator *(ON* or *OFF)*. Pressing the *Generator* softkey and the *ON/OFF* key switches the generator on or off.

The input field associated to the *Generator* softkey adjusts the total CDMA output power. The *CDMA Power* does not include the AWGN power. The total output power including the AWGN power is displayed in the table-oriented version of the *Generator* tab.

Remote control
`INITiate:RFGenerator`
`ABORt:RFGenerator`
`FETCh:RFGenerator:STATus?`
`SOURce:RFGenerator:POWer:CDMA <CDMA Power>`

F-FCH Level

The *F-FCH Level* softkey adjusts the signal level of the Fundamental Channel in the forward CDMA channel.

F-FCH Level specifies the FULL frame rate traffic channel level. If a frame rate other than FULL is used, the actual test traffic level is lower:

Test traffic level = F-FCH Level + Corr.

The level correction values *Corr.* are listed in the table below.

	RC 1		RC 2		RC 3, 4		RC 5	
	bps	Corr./ dB	bps	Corr./ dB	bps	Corr./ dB	bps	Corr./ dB
Full	9600	0	14400	0	9600	0	14400	0
Half	4800	–3	7200	–3	4800	–3	7200	–3
Quarter	2400	–6	3600	–6	2700	–5.5	3600	–6
Eighth	1200	–9	1800	–9	1500	–8	1800	–9

Remote control
`SOURce:RFGenerator:LEVel:FFCH <FFCH Level>`

F-PCH Level

The *F-PCH Level* softkey adjusts signal level of the Paging Channel in the forward CDMA channel relative to the total output power.

Remote control
`SOURce:RFGenerator:LEVel:FPCH <FPCH Level>`

F-Sync Level

The *F-Sync Level* softkey adjusts the signal level of the Sync Channel in the forward CDMA channel.

Remote control
`SOURce:RFGenerator:LEVel:FSYNc <FSYNC Level>`

F-PICH Level

The *F-PICH Level* softkey adjusts the signal level of the Pilot Channel in the forward CDMA channel.

Remote control
`SOURce:RFGenerator:LEVel:FPICh <FPICH Level>`

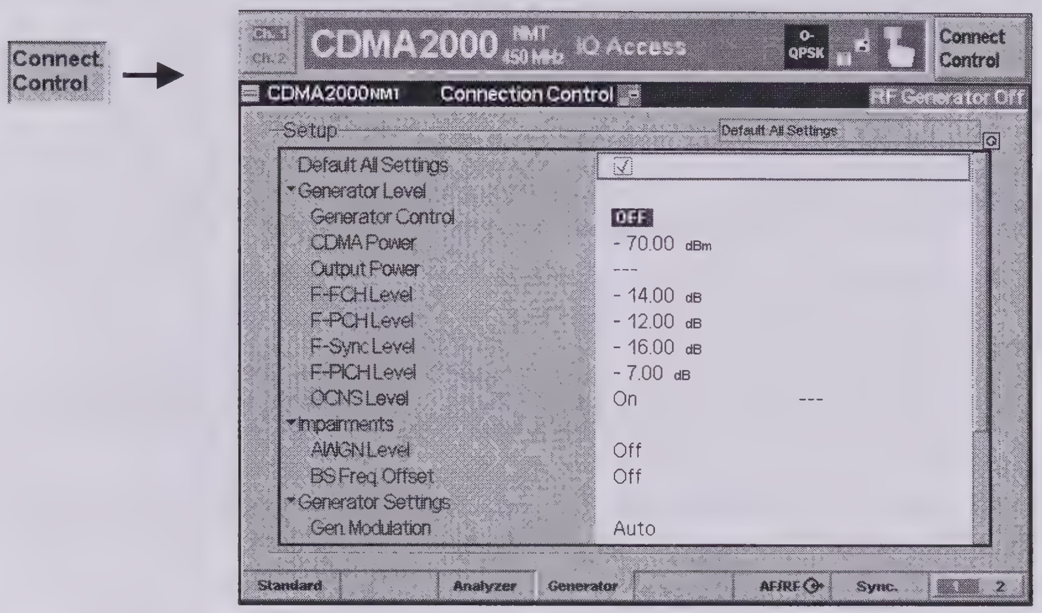
F-OCNS Level

The *OCNS* softkey displays a popup window to turn the Orthogonal Channel Noise Simulator. Setting this to *ON* ensures a defined Output Power level.

Remote control
`SOURce:RFGenerator:LEVel:OCNS:ENABle ON | OFF`

Table-Oriented Version

The table-oriented version of the *Generator* tab provides all settings described in section *Table-Oriented Version* on p. 4.21 ff. In addition, it defines the power control bits sent to the MS to control it output power *(Power Control)*.



Default All Settings	☑
Generator Level	
Generator Control	OFF
CDMA Power	- 70.00 dBm
Output Power	---
F-FCH Level	- 14.00 dB
F-PCH Level	- 12.00 dB
F-Sync Level	- 16.00 dB
F-PICH Level	- 7.00 dB
OCNS Level	On ---
Impairments	
AWGN Level	Off
BS Freq Offset	Off
Generator Settings	
Gen Modulation	Auto

Figure 4-11 Connection Control – Generator (table)

The following settings are not provided in the table-oriented version of the *Generator* tab:

Default All Settings The *Default All Settings* switch assigns default values to all settings in the *Analyzer* tab (the default values are quoted in the command description in chapter 6 of this manual).

Remote control
`DEFault:RFGenerator ON | OFF`

Generator Level – Output Power *Output Power* displays the total output power. The total *Output Power* level includes the AWGN power level. In contrast the *CDMA Power* can be set and does not include the AWGN power.

Remote control
`SOURce:RFGenerator:POWer:OUTput?`

Impairments– AWGN Level *AWGN Level* turns on or off the Additive White Gaussian Noise generator and sets the level for modulation. This provides noise to more closely simulate actual operating conditions in the network.

Note: *The total output power of the CMU is the sum of the Forward CDMA signal plus the AWGN signal. The CMU automatically limits the AWGN signal level so that the maximum possible total output power of the CMU's RF connector is not exceeded.*

Remote control
`SOURce:IMPairments:LEVel:AWGN <AWGN Level>`

Impairments– BS Freq. Offset
BS Freq. Offset adjusts the carrier frequency of the CMU/base station. This setting is disabled if the *RF Frequency* is adjusted away from a standard *RF Channel* frequency.

Remote control
`SOURce:IMPairments:FOFFset[:RF] <Freq. Offset>`

Generator Settings – Gen. Modulation
Generator Modulation selects the method used to modulate the generated RF signal. *AUTomatic* generates a CDMA2000 signal according to channel configuration. *OFF* generates an empty carrier signal (continuous wave).

Remote control
`SOURce:RFGenerator:MODulation:MODe AUTomatic | OFF`

RF Channel
The *RF Channel* sets the base station channel number (and frequency) of the generated RF signal. Changing the RF Channel resets the RF Frequency setting. The default settings for the channel numbers are dependent on the network selected.

Table 1-1 in Chapter 1 lists the networks and standards supported by the CMU with the CDMA options.

Remote control
`SOURce:RFGenerator:CHANnel:FFCH <FFCH Channel>`

F-FCH Channel
F-FCH Channel sets the fundamental channel to use in the forward CDMA channel. The CMU automatically shifts an OCNS channel if channel conflicts occur. Changing this value causes a hard handoff to be performed (if a call is established). Refer to page 4.20 for more information on OCNS channels.

Remote control
`SOURce:RFGenerator:CHANnel:FFCH <FFCH Channel>`

F-FCH QOF
FCH QOF selects the Quasi-orthogonal Function that the Forward Fundamental Channel uses in the forward CDMA channel.

F-FCH Frame Offset
F-FCH Frame Offset sets the frame offset in the forward fundamental channel. Changing the frame offset immediately changes the traffic channel timing.

Remote control
`SOURce:RFGenerator:FROFfset:FFCH <Frame Offs>`

F-FCH Frame Rate
F-FCH Frame Rate sets the frame rate to Full, Half, Quarter, or Eighth.

Remote control
`SOURce:RFGenerator:FRATe:FFCH <Frame Rate>`

PN Offset
PN Offset sets the offset of the PN sequence. Changing the PN offset changes the timing of the pilot channel, the timing and contents of the sync channel message, and the long code mask of the paging channel.

Remote control
`SOURce:RFGenerator:PROPerty:PNOFfset <PN Offset>`

Power Control *Power Ctl. Bits* defines the Power Control Bit (PCB) sequence that the CMU sends to the mobile station to control its total output power (closed loop power control).

Note: *The power control bits must be compatible with the measurement task. All PCB modes except Auto can drive the MS transmitter outside the power range necessary for a particular measurement.*

Auto	Active closed loop power control: the CMU sends the power control bits needed to control the MS transmitter output power to the expected value (equal to the *RF Max. Level,* see section *Analyzer Control (Connection Control – Analyzer)* on p. 4.17 ff.). The *RF Max. Level* is also indicated in the *Settings* table of the *Analyzer/Generator* menu.
Hold	The CMU sends alternating *up/down* power control bits.
All Down	The CMU sends only *down* power control bits. This will cause the mobile station's power level to decrease to a level too low for measurements to be made.
All Up	The CMU sends only *up* power control bits.
Range Test	The CMU sends a sequence of 128 *up* power bits (= 8 frames) followed by a sequence of 128 *down* power bits.
Pattern	Use the bit sequence defined in the *Pattern* section.
Off	No bits are sent to the mobile station.

Remote control
`CONFigure:RFGenerator:PCBits <Power Control Bits>`

Pattern – Sequence Mode *Sequence Mode* selects an algorithm to construct the complete user-defined pattern from the single bit pattern *<Pattern>* defined in *Area 1* to *Area 4;* see Table 4-2 below.

Remote Control
`CONFigure:RFGenerator:PCBits:PATTern:SQMode`
`PREP | PFBA | PFBH`

Table 4-2 Single pattern and Sequence Mode

Sequence Mode	**Complete transferred pattern for a single pattern <Pattern>**
Pattern Repeated	<Pattern><Pattern><Pattern>...
Pattern followed by Auto	<Pattern>, then active closed loop power control
Pattern followed by Hold	<Pattern>01010101....

Pattern – Area1 / ... / Area 4

Area 1, ..., Area 4 contains the parameters to define the single bit pattern <Pattern>. <Pattern> is composed of 4 areas with variable length ≥ 1 *(Number of Bits)* but constant *Polarity.*

Example: 000011110 is valid <Pattern>. The following combination of parameters can be used to define this pattern:

Area 1,	Number of Bits	4
	Last Hold Bit	Down
Area 2,	Number of Bits	1
	Polarity	Up
Area 3,	Number of Bits	3
	Polarity	Up
Area 4,	Number of Bits	1
	Polarity	Down

Remote Control

```
CONFigure:RFGenerator:PCBits:PATTern:AREA<nr>:NOBits
CONFigure:RFGenerator:PCBits:PATTern:AREA1:LHBit
CONFigure:RFGenerator:PCBits:PATTern:AREA<nr>:POLarity
```

AF/RF Connectors (Connection Control – AF/RF)

The *AF/RF* ⊸ tab configures the connectors for RF signals. This includes defining:

- The RF input and output of the CMU (*RF Output*, *RF Input*).
- External attenuation at the connectors (*Ext. Att. Output*, *Ext. Att. Input*).

The tab also controls the wideband peak power measurement *(Wideband Power)* and indicates the result.

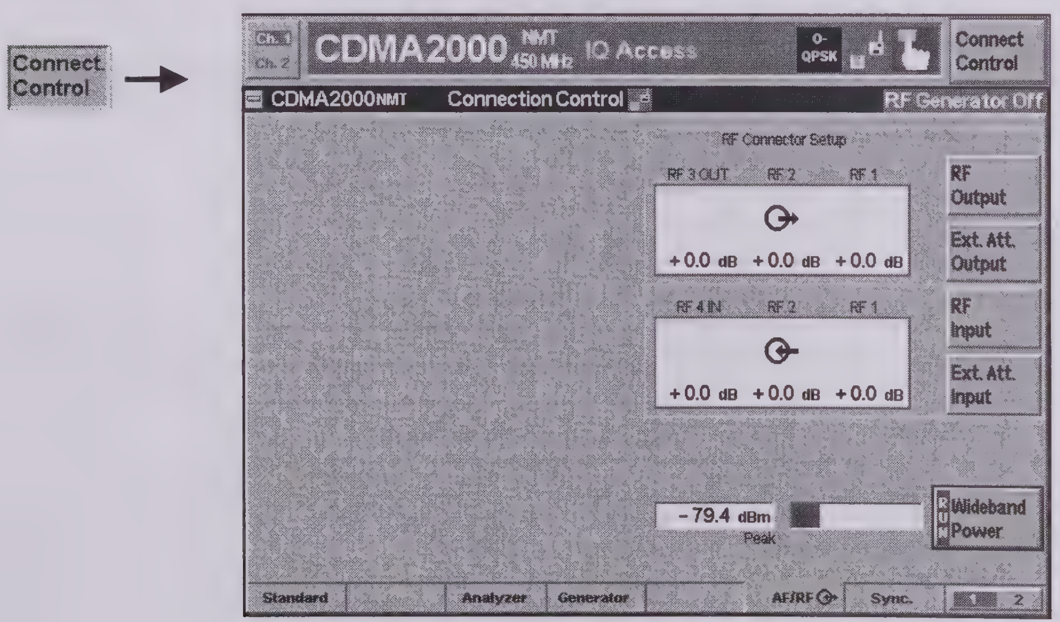


Figure 4-12 Connection Control – RF connectors

RF Output

The *RF Output* softkey defines which of the three connectors RF 1, RF 2 and RF 3 OUT is to be used as the RF output connector. The symbol ⊖→ indicates the selected RF output.

Note: *Input and output connectors can be arbitrarily combined. The bi-directional connectors RF 1 and RF 2 can be selected as RF inputs and outputs at the same time. The front panel LEDs are on (lit) if the generator is switched on or the modulation test is started.*

Remote control

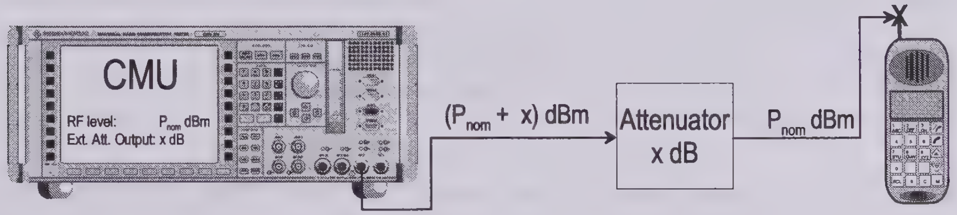
```
OUTPut[:STATe] RF1 | RF2 | RF3
```

Ext. Att. Output

The *Ext. Att. Output* softkey defines an external attenuation (or gain, if the value is negative) at the selected RF output.

External attenuation is required if attenuation (such as a cable) is included in the test setup path, which is to be corrected by an increased signal level.

If an external attenuation is defined, the output signal level is referenced to the input of the device under test (DUT), the generator level is therefore shifted with respect to the actual level at the output connector of the CMU. The default value for the generator power and the level ranges for the RF outputs are also shifted provided that the generator can output the required power, compensating for the external attenuation or gain. Otherwise it is adapted to the level closest to the shifted default value.



Remote control

```
[SENSe:]CORRection:LOSS:OUTPut<nr>[:MAGNitude]
SOURce:CORRection:LOSS:OUTPut<nr>[:MAGNitude]
```

RF Input

The *RF Input* softkey defines which of the three connectors RF 1, RF 2, or RF 4 IN is to be used as the RF input connector. The symbol ⊖← indicates the selected RF input.

Note: *Input and output connectors can be arbitrarily combined. The bi-directional connectors RF 1 and RF 2 can be selected as RF inputs and outputs at the same time. The front panel LEDs are on (lit) if a measurement is active.*

Remote control

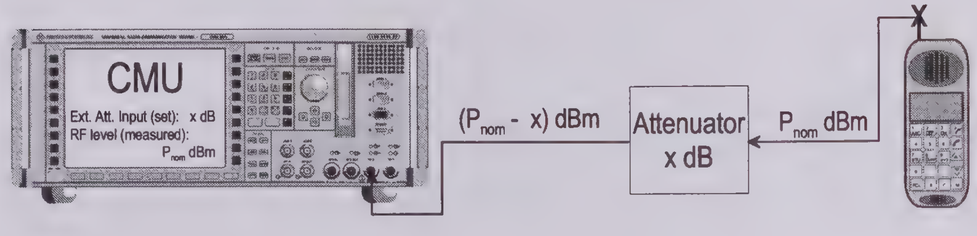
```
INPut[:STATe] RF1 | RF2 | RF4
```

Ext. Att. Input

The *Ext. Att. Input* softkey sets the value of the external attenuation (or gain) at the selected RF input.

Input of an external attenuation is required if, for example, external attenuator pads are used for protection of the sensitive RF inputs of the CMU or if path attenuation is included in the test setup.

If an external input attenuation is reported to the instrument, all levels measured are referenced to the output of the DUT and therefore shifted with respect to the actual level at the input connectors of the CMU. The level ranges for the input connectors are shifted as well.



Remote control
`[SENSe:]CORRection:LOSS:INPut<nr>[:MAGNitude]`
`SOURce:CORRection:LOSS:INPut<nr>[:MAGNitude]`

Wideband Power

The *Wideband Power* softkey controls the wideband power measurement and indicates its status *(RUN | HLT | OFF)*. The status can be changed after softkey selection (pressing once) by means of the *ON/OFF* key or the *CONT/HALT* key. The measurement result is in units of dBm. The analog bar to the right of the softkey shows the measured power relative to the *RF Max. Level* (see section *AF/RF Connectors (Connection Control – AF/RF)* on page 4.24)*:* The display range is between *RF Max. Level – 10 dB* and *RF Max. Level + 10 dB*.

The wideband power measurement is performed at the RF Frontend of the CMU and yields the peak power of the input signal inside a wide frequency range. It is most accurate in the input level range around 0 dBm (typically –10 dBm to +30 dBm on RF2). The main purpose of the wideband power measurement is to indicate whether an input signal is available and whether it is advisable to change the *Max Level* settings.

Note: *An additional quick and precise power measurement is available in remote control (keyword `NPOWer`).*

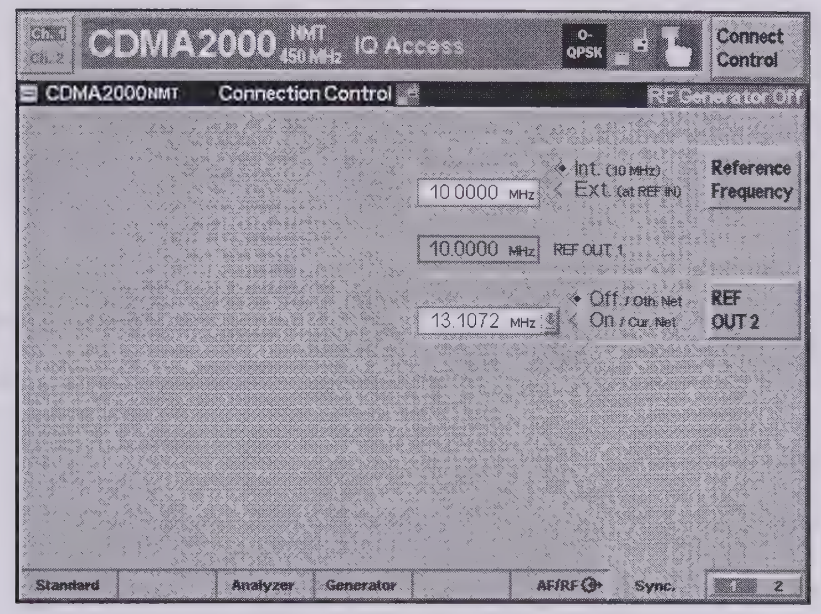
Remote control
`INITiate:WPOWer`
`FETCh:WPOWer:STATus?`
`READ[:SCALar]:WPOWer?`
`FETCh[:SCALar]:WPOWer?`
`SAMPle[:SCALar]:WPOWer?`

Reference Frequency (Connection Control – Sync.)

The popup menu *Sync.* defines the reference signals for synchronization. This includes:

- The internal or external Reference Frequency
- The output mode for the network-specific system clock (REF OUT 2)

Connect Control →



◆ Int. (10 MHz) ○ Ext. (at REF IN) 10.0000 MHz

REF OUT 1 10.0000 MHz

◆ Off / Oth. Net ○ On / Cur. Net 13.1072 MHz

Figure 4-13 Connection Control – Synchronization

Reference Frequency

The *Reference Frequency* softkey determines the source and the frequency of the reference signal. Two selections are available.

Int. (10 MHz)	The internal 10 MHz clock signal (TCXO or OCXO, CMU-B11/-B12) is used for synchronization. This signal is available at the REF OUT 1 connector at the rear of the instrument.
Ext. (at REF IN)	An external reference signal is to be supplied to the *REF IN* connector. The frequency of the external reference signal must be entered in the input field.

The reference signal used is available at the *REF OUT 1* output connector at the rear of the instrument making it available for use by other instruments.

Notes:

With external synchronization selected, a warning message cycles on and off if no synchronization has been performed e.g. because of missing or faulty input signal. At the same time, bit no. 6 (RFNL, Reference Frequency Not Locked) is set in the STATus:OPERation:CMU:SUM1:CMU1 sub-register associated to the CMU base system and the query `[SENSe:]SYNChronize:FREQuency:REFerence:LOCKed?` *returns the value* `ON`*.*

In the case of external synchronization with squarewave signals (TTL) ensure correct signal matching to avoid reflections. Otherwise, resulting overshoots may cause trigger problems at the CMU input. A possible remedy is to use a lowpass filter or an attenuator pad directly at the CMU input. Correct synchronization may be checked by comparing the signal REF OUT 1 or REF OUT 2 with the input signal.

This configuration is valid in all CMU function groups.

Remote control
The commands for the reference frequency are part of the CMU base system (see CMU200/300 operating manual):

```
CONFigure:SYNChronize:FREQuency:REFerence:MODE
      INTernal | EXTernal
CONFigure:SYNChronize:FREQuency:REFerence <Frequency>
[SENSe:]SYNChronize:FREQuency:REFerence:LOCKed?
```

REF OUT 2

The *REF OUT 2* softkey configures a network-specific system clock available at the *REF OUT 2* output connector at the rear of the instrument. The associated field allows selection between two settings:

OFF (other network)	The clock frequency of another active function group is made available at the REF OUT 2 connector instead of the current function group. The REF OUT 2 must be switched on in the other function group.
On (current network)	The network-specific system clock of the current function group is available at the REF OUT 2 output connector.

The clock frequency can be used to synchronize other instruments.

Remote control

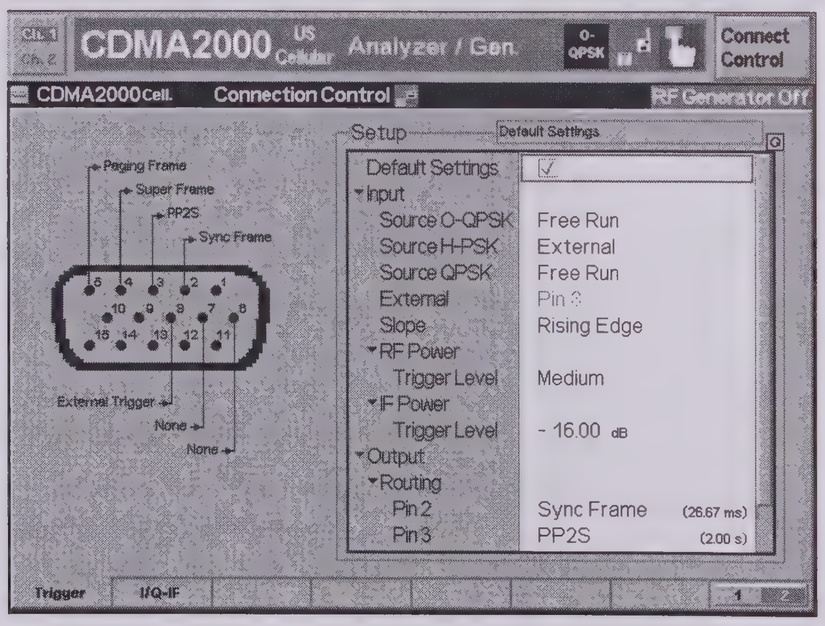
```
SOURce:DM:CLOCk:STATe ON | OFF
SOURce:DM:CLOCk:FREQuency <Frequency>
```

Trigger (Connection Control – Trigger)

The *Trigger* tab is part of the second group of tabs in the *Connection Control* menu. It is accessible after pressing the *1 / 2* toggle hotkey once. Pressing *1 / 2* again switches back to the first group of tabs described above.

The *Trigger* tab defines the trigger condition for the measurement and the routing of output trigger signals.

Connect. Control →



Setup — Default Settings

Default Settings ☑
Input
Source O-QPSK Free Run
Source H-PSK External
Source QPSK Free Run
External Pin 3
Slope Rising Edge
RF Power
Trigger Level Medium
IF Power
Trigger Level - 16.00 dB
Output
Routing
Pin 2 Sync Frame (26.67 ms)
Pin 3 PP2S (2.00 s)

Fig. 4-14 Connection Control – Trigger

Default Settings The *Default Settings* checkbox assigns the default setting to all functions in the *Trigger* tab (the default values are quoted in the command description in chapter 6 of this manual).

Remote control

```
DEFault:TRIGger[:SEQuence]
DEFault:TRIGger[:SEQuence]:SOURce
```

Input – Source *Source* selects the source for the trigger event:

Free Run	No trigger. Measurement is repeated without delay.
RF Power	The measurement is triggered by the burst level (rising or falling edge; see *Slope* setting below) of the RF input signal, at a selectable *Trigger Level*. Wideband power trigger at the RF Front End of the R&S CMU.
IF Power	The measurement is triggered by the level of the IF signal (rising or falling edge; see *Slope* setting below), at a selectable *Trigger Level*. Narrow-band IF power trigger.
External	External trigger signal fed in via pin 8 of the AUX connector at the front of the instrument.
Internal	20 ms frame trigger signal provided by the RF generator of the R&S CMU. The internal trigger signal is synchronized to the generated forward CDMA signal and can be routed to AUX 3; see *Output – Routing* below.

For the *RF Power* and *IF Power* settings the RF input signal must be ramping (e.g. a CDMA2000 signal with a FCH frame rate ≠Full). *RF Power* trigger signals have a small dynamic range which may not be sufficient for triggering. It is recommended to trigger by the *IF Power* instead.

Note: *The Internal trigger signal and the output frame trigger is only available while the RF generator is switched on.*

Trigger and modulation scheme The trigger source can be selected independently for the three modulation schemes 0-QPSK, H-PSK and QPSK (see section *Analyzer/Generator* on p. 4.2 ff.). The R&S CMU places no restrictions on the trigger source selection, however, some measurements may fail with an inappropriate trigger setting. The following rules apply:

1. 0-QPSK and QPSK measurements can be made with all trigger settings.
2. All H-PSK measurement applications require a synchronization between the DUT and the *Internal* or *External* trigger signal. No measurements can be made with *RF Power* and *IF Power* trigger or in the *Free Run* mode. In *Signalling* mode, the DUT is automatically synchronized to the *Internal (Signalling)* trigger signal.
3. Similar restrictions apply to *Transmit Time Error* measurements; see below.

Timing error measurement The trigger setting affects the results of the *Transmit Time Error* measurement as described below.

Free Run, IF Power, RF Power	Timing error results are not available.
Internal	Timing error results are possible when DUT is synchronized with the CMU.
External	Timing error results are available if an external trigger signal is supplied via AUX 3 and the DUT is synchronized with the CMU.

No *Transmit Time Error* measurement is available for QPSK.

Remote control

```
TRIGger[:SEQuence]:SOURce[:OQPSk]
TRIGger[:SEQuence]:SOURce:HPSK
TRIGger[:SEQuence]:SOURce:QPSK
INTernal | EXTernal | FRUN | RFPower | IFPower
```

Slope

Slope qualifies whether the trigger event occurs on the *Rising Edge* or on the *Falling Edge* of the trigger signal. The setting has an influence on *RF Power* or *IF Power* trigger only.

Remote control

```
TRIGger[:SEQuence]:SLOPe POSitive | NEGative
```

RF Power /
IF Power

...Trigger Level

The *Trigger Level* parameters define the trigger thresholds if the measurement is triggered by the *RF Power* or *IF Power* (see *Source* function above), respectively. Both thresholds are defined relative to the maximum input level set in the *Analyzer* tab (see *RF Max. Level* softkey on p. 4.17). The *Level* settings have no influence on *Free Run, Internal* or *External* trigger measurements.

Note: *The trigger levels are always relative to the **current** maximum input level. If* RF Manual Max. Level *is used* (RF Mode = Manual)*, the current input level is constant and equal to the defined value. In autoranging mode* (RF Mode = Auto)*, the current maximum input level is dynamically adapted to the measured RF input level; the trigger levels change accordingly.*

The ***RF Power*** trigger threshold is the RF input signal level *(Wideband Power*, see p. 4.26) beyond which the trigger condition is satisfied and a measurement is initiated.

Low	Low trigger threshold, equal to approx. the maximum input level –26 dB.
Medium	Medium trigger threshold, equal to approx. the maximum input level –16 dB.
High	High trigger threshold, equal to approx. the maximum input level –6 dB.

The ***IF Power*** trigger threshold is the IF trigger signal level beyond which the trigger condition is satisfied and a measurement is initiated. The *IF Power* input value defines the trigger threshold relative to the maximum input level:

IF power trigger threshold = <max. input level> + <IF Power>

Remote control

```
TRIGger[:SEQuence]:THReshold:RFPower LOW | MEDium | HIGH
TRIGger[:SEQuence]:THReshold:IFPower <Power>
```

Output –
Routing

The *Routing* functions select the type of periodic pulse signal (or no signal, setting *NONE)* to be applied to pins 2, 3, 4,and 5 of the AUX 3 connector. The output frame trigger is available if the *Internal* trigger source is selected and the RF generator is switched on. It consists of a high-pulse TTL signal with its rising edge at the beginning of the frames of the forward signal.

The CMU provides output trigger signals with the following periodicity:

Power Ctrl. Frame	1.25 ms
Paging Frame	20 ms

Sync Frame	26.67 ms
Super Frame	80 ms
PP2S	2 s

All signals can be selected for each of the pins 2 to 5. The current AUX 3 pin assignment (including the external trigger input at pin 8) is shown in the diagram to the left of the trigger *Setup* table.

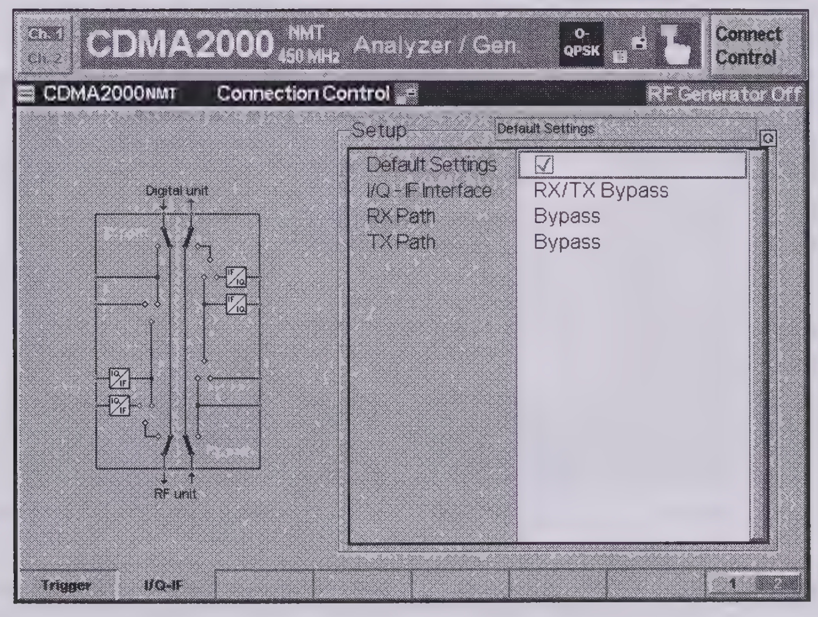
Remote control `TRIGger:OUTPut:PIN<nr>:SIGNal <Frame_Period>`

I/Q-IF Interface (Connection Control – I/Q-IF)

The *I/Q-IF* tab is part of the second group of tabs in the *Connection Control* menu. It is accessible after pressing the *1 / 2* toggle hotkey once. Pressing *1 / 2* again switches back to the first group of tabs described above.

The *I/Q-IF* tab configures the signal paths for I/Q and IF signals. With option CMU-B17, *I/Q and IF Interfaces,* I/Q and IF signals can be used in the framework of *RF* measurements and in many network tests. For a detailed description of rear panel connectors for I/Q and IF input/output signals, test scenarios and application examples refer to the CMU200/300 operating manual.

Connect Control →



Setup: Default Settings

Default Settings	☑
I/Q - IF Interface	RX/TX Bypass
RX Path	Bypass
TX Path	Bypass

Fig. 4-15 Connection Control – I/Q-IF

Default Settings The *Default Settings* checkbox assigns the default setting to all functions in the *I/Q-IF* tab.

Remote control `IQIF:DEFault ON | OFF`

I/Q-IF Selects the I/Q-IF test scenario, overwriting the current *RX Path* and *TX Path* settings. Six different predefined test scenarios with fixed RX and TX path are provided; see *Table 4-3 below.*

Additional scenarios may be defined by selecting any other combination of RX and TX paths. When this is done *I/Q-IF* is set to *User-defined.* The circuit diagram to the left of the *Setup* table shows the current RX and TX signal paths.

Remote control `CONFigure:IQIF:RXTXcombined`

```
          BYP | BYIQ | XOIO | IOIO | IOXO | FPAT | UDEF
```

RX Path Selects the RX signal path, leaving the *TX Path* unchanged but adapting the I/Q-IF test scenario to the new RX/TX path combination: If the combination corresponds to a predefined scenario, then *I/Q-IF* is set to the predefined scenario; otherwise it is set to *User-defined*.

The circuit diagram to the left of the *Setup* table shows the current RX and TX signal paths.

Remote control

```
CONFigure:IQIF:RXPath
          BYP | BYIQ | XOIO | IOIO | IOXO | FPAT | UDEF
```

RX Path Selects the TX signal path, leaving the *RX Path* unchanged but adapting the I/Q-IF test scenario to the new RX/TX path combination: If the combination corresponds to a predefined scenario, then *I/Q-IF* is set to the predefined scenario; otherwise it is set to *User-defined*.

The circuit diagram to the left of the *Setup* table shows the current RX and TX signal paths.

Remote control

```
CONFigure:IQIF:TXPath
          BYP | BYIQ | XOIO | IOIO | IOXO | FPAT | UDEF
```

Table 4-3 I/Q-IF scenarios and path settings

I/Q-IF	**RX Path**	**TX Path**	**Remark/Application** (see also CMU manual)
RX/TX Bypass	Bypass	Bypass	No I/Q or IF inputs/outputs connected Direct signal analysis and transmission with full measurement accuracy
Byp. w. I/Q-OF OUT	Bypass w. I/Q-IF OUT	Bypass w. I/Q-IF OUT	No I/Q or IF inputs connected Analysis of received and transmitted signal via I/Q or IF
I/Q IN/OUT	I/Q IN/OUT	I/Q IN/OUT	Insertion of signal to be analyzed and transmitted on I/Q level
IF IN_I/Q IN/OUT	IF IN_I/Q IN/OUT	IF IN_I/Q IN/OUT	Additional processing of received and transmitted signal on IF level (filters etc.) and analysis via I/Q
IF IN/OUT	IF IN/OUT	IF IN/OUT	Insertion of signal to be analyzed and transmitted on IF level
Fading	Bypass	I/Q IN/OUT	Direct analysis of received signal Modification (fading) of transmitted signal by means of an external fading simulator (SMIQ, ABFS)
User-defined	Any combination of RX Path and TX Path not listed above		Any combination of RX and TX test cases listed above

CDMA Measurements

The structure of this section is based on the configuration and measurement groups defined in CDMA2000 *Signalling* function group. In the screen shots signalling states may change (such as function group and radio configurations) to illustrate measurements and settings.

The menus are described in the following order:

1. Call setup to the mobile station *(Connection Control – Connection (Signal Off / Signal On / Registered))*
2. Overview of measurements and general settings *(Overview)*
3. Application menus *(Overview, Power, Modulation, Code Domain Power, Receiver Quality):* Purpose of the measurements and relation to the test specifications and conformance requirements, description of measurement results, specific measurement configurations
4. General device configurations *(Connection Control)*

The *Signalling* mode is activated in the *Menu Select* menu (with associated key at the front panel).

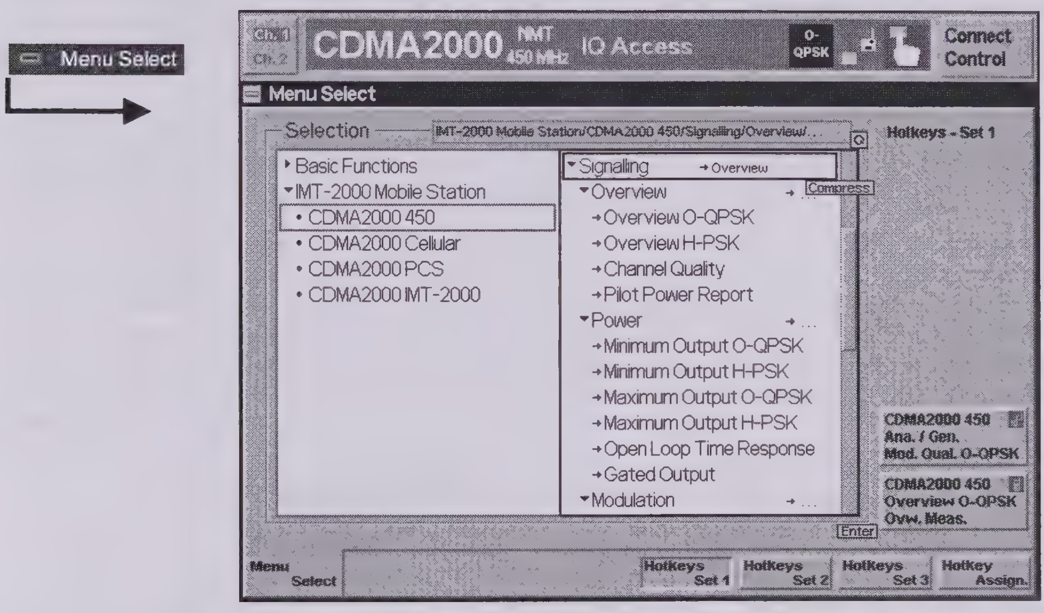


Figure 4-16 CDMA applications in Signalling mode

Since making measurements requires a connection to a mobile station, the CMU200 immediately displays the *Connect Control* menu when selecting a CDMA2000 Signalling Mode.

Table 1-1 in Chapter 1 provides a list of the available CDMA networks supported.

The TX measurements depend depend on the Reverse Radio Configuration (R-RC) of the mobile station which can be set in the *Service Cfg.* tab of the *Connection Control* menu (see section *Service Configuration of the CMU (Connection Control – Service Cfg.)* on p. 4.108 ff.). *Table 4-4* provides a list of the measurements available per radio configuration.

Table 4-4 Radio Configuration and Available Measurements

Reverse-Radio Configurations 1 & 2		**Reverse-Radio Configurations 3 & 4**	
O-QPSK Measurements		H-PSK Measurements	
Overview	Yes	Overview	Yes
Minimum Power	Yes	Minimum Power	Yes
Maximum Power	Yes	Maximum Power	Yes
Modulation Measurements	Yes	Modulation Measurements	Yes
H-PSK measurements	No Results	O-QPSK measurements	Invalid Results
Gated Output Power	Yes	Gated Output Power	No
Open Loop Time Response	Yes	Open Loop Time Response	Yes
Code Domain Power	No	Code Domain Power	Yes
Receiver Quality (Loopback or Test Data Service only)	Yes	Receiver Quality (Loopback or Test Data Service only)	Yes

Call Setup (Connection Control)

The *Connection Control* popup menu controls the signalling (call setup and release, services, signalling parameters) and configures the inputs and outputs with the external attenuation values and the reference frequency.

The term signalling summarizes all procedures necessary for call setup and release and for control of a connection in the mobile radio network. In the case of the CMU, a distinction is made between four different signalling states:

Signal Off	CMU transmits no signal
Signal On/MS Unregistered	CMU outputs a control channel signal *(BS Signal)* to which a mobile station can synchronize
Registered	Registration with the mobile station and location update performed
Connected	Call established with a mobile station

A number of control commands which can be initiated both by the CMU *(Call initiated from the CMU)* and by the mobile station *(Call initiated from MS)* switch between these states.

Most applications within the function group *CDMA2000 Signalling* are only possible (or useful) in a particular signalling state (for example, handoff between various networks requires an existing connection between the CMU and mobile station, i.e. it is only possible in the *Connected* state). Functionality of some menus vary depending on the signalling state.

Note: *A fifth, transitory signalling state (Alerting) exists if the Service Class is set to Speech Service; see Figure 4-17 below. Moreover, additional transitory states (not shown in Figure 4-17) occur during handoff and Send SMS procedures; see section Handoff to Another Network (Connection Control – Handoff) on p.* 4.106 *ff. and Send SMS softkey on p.* 4.41.

Since the measurements in signalling mode require an existing connection to a mobile station, the menus for setting up the call (*Connection Control - Connection*) appear immediately after selecting a signalling mode (unless this feature is disabled). The connection control menus can be accessed any time by pressing the *Connect Control* softkey at the top right corner in any measurement menu. The hotkey bar (at the bottom the screen) links the measurement menus together. Pressing the *Escape* key or the *Connect Control* softkey closes the connection control menu and the CMU changes to the measurement mode.

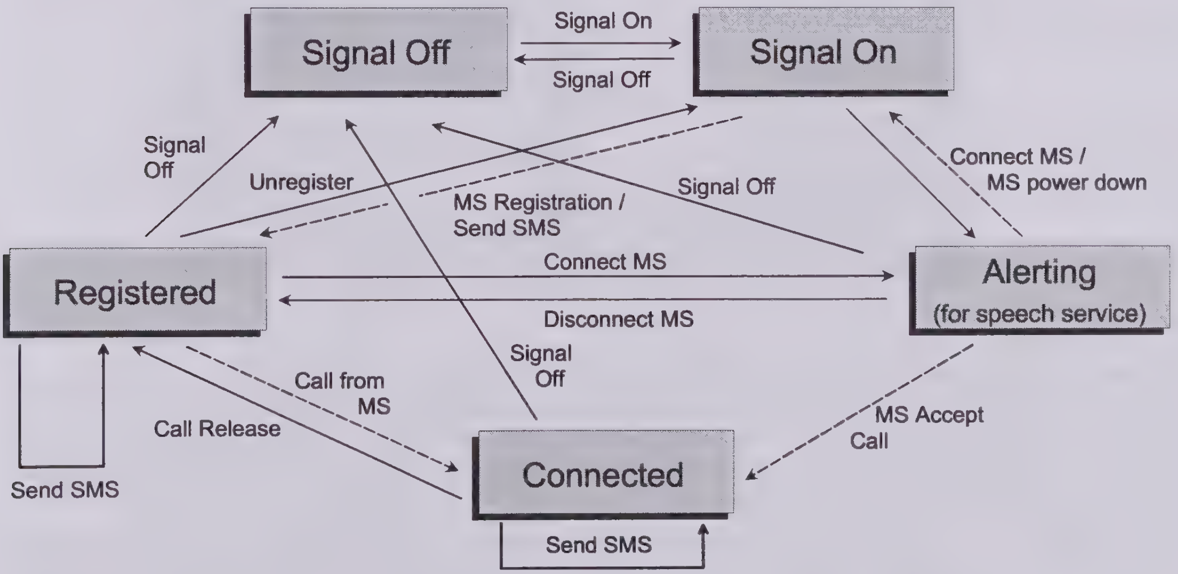


Figure 4-17 Signalling states of the CMU

Corresponding to the five possible signalling states, five different *Connection* tabs are available. When one of the signalling states *Signal Off, Signal On, Registered* or *Alerting* is reached, the corresponding tab is opened automatically. On the other hand the *Connected* tab is closed immediately after the CMU reaches the *Connected* state so that a measurement can be started.

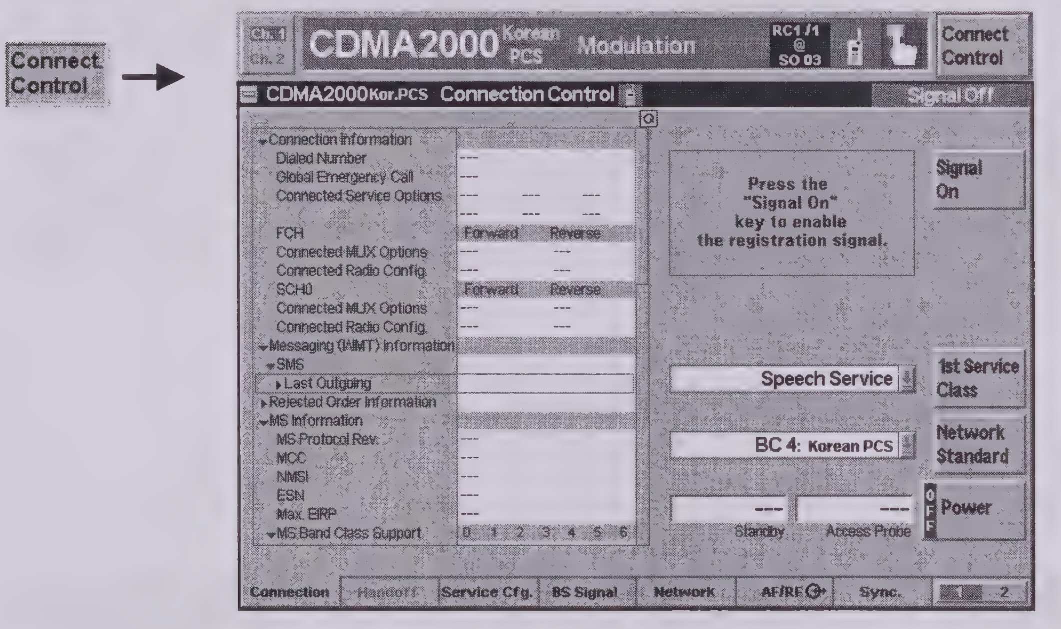
Note: *The automatic display or close of the* Connection Control *menu is controlled within the* User Guidance *section of the* Misc. *tab of the* Connection Control *menus. See page* 4.142.

For a complete overview of signalling states including the Handoff process see Fig. 6.1 in Chapter 6 of this manual.

In the following, the tab *Connection Control – Connection* displayed during the call setup is described. The other tabs of the *Connection Control* menu are described at the end of this chapter beginning on page 4.104.

Connection Control (Signal Off State)

In the *Signal Off* state, the CMU does not output any RF signals. In addition to the parameter overview described in section *Connection Control with Connection Established* on p. 4.104 ff. the popup menu *Connection (Signal Off)* activates the RF channel signal for the call setup to the mobile station *(Signal On,* see *Figure 4-17* on p. 4.35), selects the Primary Service Class *(1st Service Class)* and the *Network Standard* and controls the standby and access probe power measurement *(Power).*



Press the "Signal On" key to enable the registration signal.

Speech Service

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Figure 4-18 Connect Control – Connection (Signal Off)

The parameter overview in the left half of the menu is also indicated in the other *Connection* tabs and is described in section *Connection Control with Connection Established* on p. 4.104 ff. Some parameters are not always available, depending on the current and previous signalling states and settings. In this case the table shows invalid or unavailable settings ("---"). In the *Signal Off* state, the parameter overview contains the current conditions of the connection to be set up to the mobile station.

Message box A message displayed in each *Connection* tab provides the current instrument state or indicates how to proceed to get to other signalling states. In this instance, the message `Press the Signal On key to enable the registration signal` is displayed.

Signal On

The *Signal On* softkey switches on the RF generator. Switching the RF generator on changes the Signalling state from the *Signal Off* state to the *Signal On* state and the CMU waits for the mobile station to register.

Remote Control

```
PROCedure:SIGNalling:ACTion
SON
```

1st Service Class

The *1st Service Class* softkey selects the Primary Service Class, i.e. the call mode method to use when connecting to the mobile station.

Loopback Service	Is generally used for testing. In particular, CDMA2000 receiver quality measurements require that a *Loopback Service* call be established with the mobile station.
Speech Service	Is used to place a voice call to the mobile. *Modulation* measurements and the other TX tests may run slower in *Speech Service* since the mobile station signal may not be using Full Rate. *Receiver Quality* tests are not possible.
Test Data Service	Is used for testing the high data rates using the supplemental channels (SCH0 and SCH1).
Packet Data Service	Is used to request packet data service through a serving node supporting an Internet standard Point-to-Point Protocol (PPP) interface to network layer protocols.
Messaging Teleservice (WMT)	Is used to set up an intermediate connection using service option 6 at fixed FCH configuration in order to test the Short Message Service (SMS) capability of the mobile station. The CMU can deliver short messages of up to 160 characters. The Wireless Messaging Teleservice (WMT) is not available in the *Connected* signalling state. If WMT is active the *Send SMS* softkey in the *Connection (Signal On)* or *Connection (Registered)* tab (see p. 4.41) sets up the connection and sends the short message.

The parameters for the service types (including the short message text) are configured in the *Service Cfg.* tab; see p. 4.108 ff.

Remote Control

```
CONFigure:SCONfig:SCLass<nr>:SERVice
      LOOP | SPEech | TDAT | PDAT | WMT
PROCedure:SCONfig:SCLass<nr>:SERVice LOOP | SPEech | TDAT |
PDAT
```

Network Standard

The *Network Standard* softkey displays the network selected from the *Menu Select* menu.

Pressing the *Network Standard* softkey allows you to change between the supported band classes for the network. Refer to *Figure 4-16* on page 4.33 for a list of the supported CDMA2000 networks.

Remote Control

```
CONFigure:NETWork:STANdard
N45T |USC | KCEL | TACS | JTAC | NA7C | NA9C | NAS8 | NAPC |
KPCS | B18M | IM2K
```

Power

The *Power* softkey controls the standby and access probe power measurement and indicates its status *(RUN | HLT | OFF)*. The status can be changed after softkey selection (pressing once) by means of the *ON/OFF* key or the *CONT/HALT* key. The measurement result is in units of dBm. The *Standby Power* and *Access Probe Power* fields are blank until the mobile station registers.

Standby Power	Power of the mobile station while it is not transmitting. The *Standby Power* is measured using a 1 MHz filter (see also standard IS-98-D).
Access Probe Power	Power of the mobile station's access probes during its registration. A mobile station transmits access probes during its power on cycle, at the CMU's timer based registration setting and when the mobile initiates a call. The *Access Probe Power* is measured using the receiver filter specified in standard TIA/EIA/IS-2000.2-A.

Note: *The* Standby Power *and* Access Probe Power *measurements only run if the underlying measurement is turned off. Press the* Connect Control *softkey to see the status of the current underlying measurement.*

Remote control of the Standby Power and Access Probe Power measurements are not typically affected by the status of the underlying measurement since remote control measurements are run in single shot mode.

Remote Control

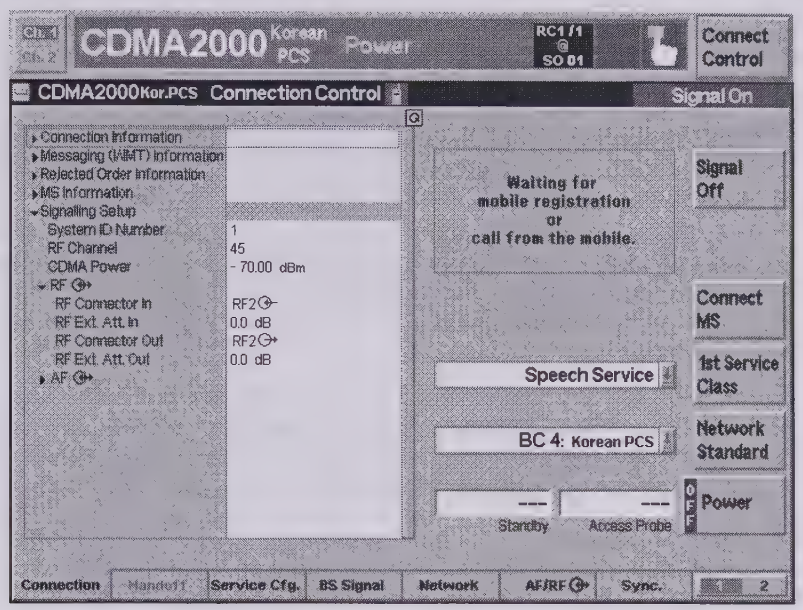
```
INITiate:SAPPower
FETCh:SAPPower:STATus?
READ[:SCALar]:SAPPower?
FETCh[:SCALar]:SAPPower?
SAMPle[:SCALar]:SAPPower?
```

Connection Control (Signal On State)

In addition to the parameter overview described in section *Connection Control with Connection Established* on p. 4.104 ff., the *1st Service Class* and *Network Standard* softkeys, and the standby and access probe power measurement described in section *Connection Control (Signal Off State)* on p. 4.36 ff., the *Connection (Signal On)* tab contains the following softkeys which lead to other services or signalling states (see *Figure 4-17* on p. 4.35):

- Deactivating the CMU's CDMA signal *(Signal Off)*
- Establishing a call to the mobile station if registration has taken place (*Connect MS* ⇒ state *Connected)*

Connect. Control →



System ID Number 1
RF Channel 45
CDMA Power - 70.00 dBm
RF Connector In RF2
RF Ext. Att. In 0.0 dB
RF Connector Out RF2
RF Ext. Att. Out 0.0 dB

Waiting for mobile registration or call from the mobile.

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--- ---

Figure 4-19 Connect Control – Connection (Signal On)

The parameter overview in the left half of the menu is also indicated in the other *Connection* tabs and is described in section *Connection Control with Connection Established* on p. 4.104 ff. Some parameters are not always available, depending on the current and previous signalling states and settings. In this case the table shows invalid or unavailable settings ("---").

Message box A message displayed in each *Connection* tab provides the current instrument state or indicates how to proceed to get to other signalling states. In this instance, the message `Waiting for MS Registration or for MS to originate call` is displayed.

Signal Off

The *Signal Off* softkey switches off the CMU's RF signal. Switching the signal off causes the CMU to change to the *Signal Off* state.

Remote Control `PROCedure:Signalling:ACTion SOFF`

Connect MS

The *Connect MS* softkey attempts to set up a call to the mobile station using the mobile ID from the previous registration or the mobile ID entered in the *Network* tab (see *Mobile ID (MIN/IMSI)* function on p. 4.135). The type of call is dependent on the Primary Service Class selected. If the mobile ID does not match, a call will not be established.

- Once the call is established, the CMU displays the *Connected* state. Refer to page 4.104. If *Speech Service* is selected as Primary Service Class (see *1st Service Class* softkey on p. 4.37), the CMU pauses in the *Alerting* state while the phone is ringing and the call needs to be answered to reach the *Connected* state.
- If the mobile registers but fails to establish a call with the CMU, the CMU will display the *Connection Control Registered* screen. Refer to page 4.40.

Connect MS is available only for the Primary Service Classes *Loopback Service, Speech Service,* and *Test Data Service.* If *Messaging (WMT)* is selected, the softkey is replaced by *Send SMS,* see below.

Remote Control `PROCedure:SIGNalling:ACTion CTM`

Send SMS

The *Send SMS* softkey intermediately sets up a call to the mobile station using service option 6 at fixed FCH configuration and the mobile ID from the previous registration. Afterwards the CMU delivers a short message to the mobile station and returns to the *Registered* state. The short message is a text of a maximum of 160 characters that is defined, together with other SMS parameters, in the *Service Cfg.* tab (see section *Messaging Teleservice* on p. 4.122 ff.). The current short message is also displayed in the parameter overview, section *Messaging (WMT) Information.*

Connect MS is available only for the Primary Service Class *Messaging (WMT);* see *1st Service Class* softkey on p. 4.37. If one of the other service classes is selected, the softkey is replaced by *Connect MS,* see above. With this configuration, an SMS can be delivered in the *Connected* state.

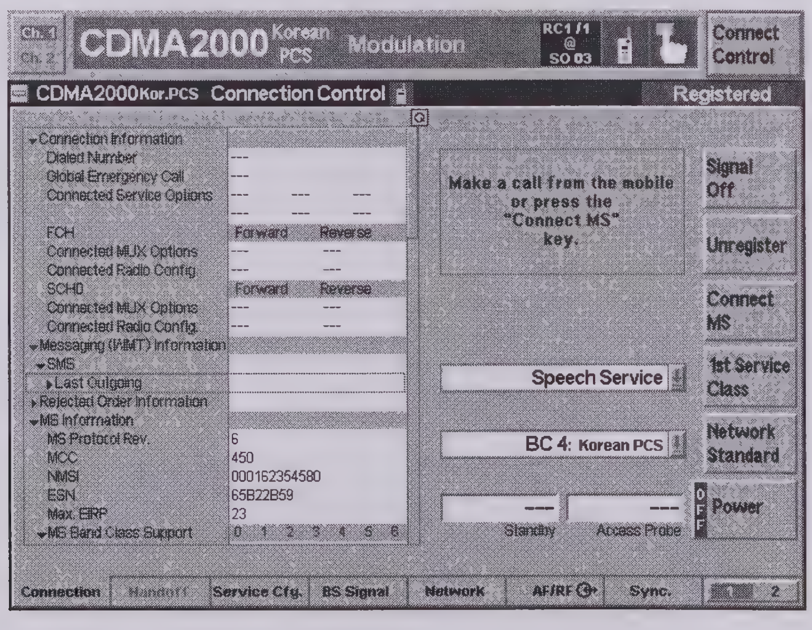
Remote control
`PROCedure:SIGNalling:ACTion SMESsage`

Connection Control (Registered State)

In addition to the parameter overview described in section *Connection Control with Connection Established* on p. 4.104 ff., the 1^{st} *Service Class* and *Network Standard* softkeys, and the standby and access probe power measurement described in section *Connection Control (Signal Off State)* on p. 4.36 ff., the *Connection (Registered)* tab contains the following softkeys which lead to other services or signalling states (see *Figure 4-17* on p. 4.35):

- Deactivating the CMU's CDMA signal *(Signal Off)*
- Returning to the *Signal On* state where the UE can attempt a new registration *(Unregister* -> return to state *Signal On)*
- Establishing a connection to the mobile station (*Connect MS* ⇒ state *Connected)* or send a short message *(Send SMS)*

Connect. Control →



Connection Information
Dialed Number ---
Global Emergency Call ---
Connected Service Options --- --- --- / --- --- ---
FCH Forward Reverse
Connected MUX Options --- ---
Connected Radio Config. --- ---
SCH0 Forward Reverse
Connected MUX Options --- ---
Connected Radio Config. --- ---
Messaging (WMT) Information
SMS
Last Outgoing
Rejected Order Information
MS Information
MS Protocol Rev. 6
MCC 450
NMSI 000162354580
ESN 65B22B59
Max. EIRP 23
MS Band Class Support 0 1 2 3 4 5 6

Make a call from the mobile or press the "Connect MS" key.

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Standby ---
Access Probe ---

Figure 4-20 Connect Control – Connection (Registered)

The softkey *Signal Off* is described in section *Connection Control (Signal On State)* on p. 4.38 ff.

The parameter overview in the left half of the menu is also indicated in the other *Connection* tabs and is described in section *Connection Control with Connection Established* on p. 4.104 ff. Some parameters are not always available, depending on the current and previous signalling states and settings. In this case the table shows invalid or unavailable settings ("---"). In the *Registered* state, the parameter overview contains the MS information provided during registration.

Message box A message displayed in each *Connection* tab provides the current instrument state or indicates how to proceed to get to other signalling states. In this instance, the message `Make a call from the mobile or press the “Connect MS”` key is displayed.

Unregister

The *Unregister* softkey unregisters the CMU from the mobile station and returns the CMU to the MS Unregistered state (refer to page 4.38). This feature can be useful if the MS is replaced without switching the CDMA signal *(BS signal)* off.

Remote Control `PROCedure:Signalling:ACTion UNRegister`

Connect MS

The *Connect MS* softkey attempts to set up a call to the registered mobile station.

- Once the call is established, the CMU displays the *Connected* State. Refer to page 4.104. If *Speech Service* is selected as Primary Service Class (see *1st Service Class* softkey on p. 4.37), the CMU pauses in the *Alerting* state while the phone is ringing and the call needs to be answered to reach the *Connected* state.
- If the mobile fails to establish a call with the CMU, the CMU remains in the *Registered* screen.

Connect MS is available only for the Primary Service Classes *Loopback Service, Speech Service,* and *Test Data Service.* If *Messaging (WMT)* is selected, the softkey is replaced by *Send SMS,* see below.

Remote Control `PROCedure:SIGNalling:ACTion CTM`

Send SMS

The *Send SMS* softkey intermediately sets up a call to the mobile station using service option 6 at fixed FCH configuration and delivers a short message to the mobile station. Afterwards the CMU returns to the *Registered* state. The short message is a text of a maximum of 160 characters that is defined, together with other SMS parameters, in the *Service Cfg.* tab (see section *Messaging Teleservice* on p. 4.122 ff.). The current short message is also displayed in the parameter overview, section *Messaging (WMT) Information.*

Connect SMS is available only for the Primary Service Class *Messaging (WMT);* see *1st Service Class* softkey on p. 4.37. If one of the other service classes is selected, the softkey is replaced by *Connect MS,* see above. With this configuration, an SMS can be delivered in the *Connected* state.

Remote control
`PROCedure:SIGNalling:ACTion SMESsage`

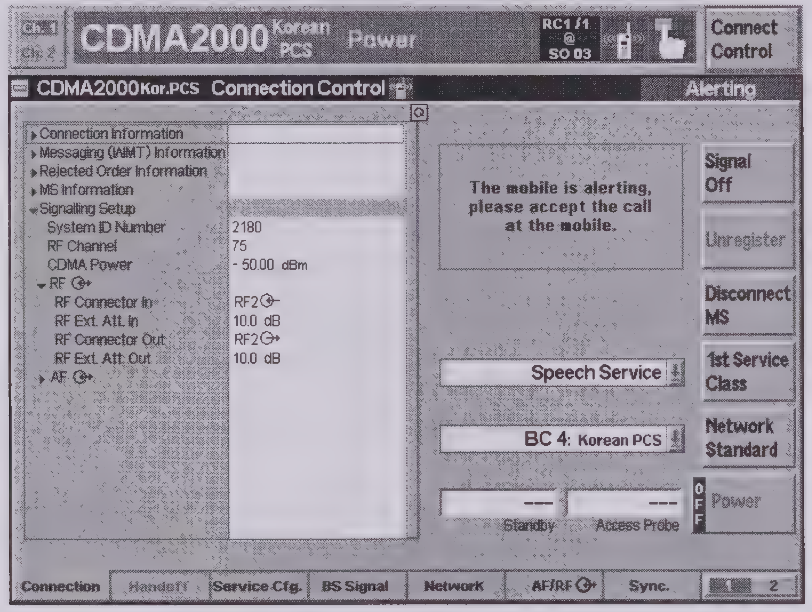
Connection Control (Alerting State)

The Alerting state is reached if the *1st Service Class* is set to *Speech Service* to establish a voice call to the mobile station. In this state, the mobile station is ringing and the call needs to be answered to connect to the mobile station.

In addition to the parameter overview described in section *Connection Control with Connection Established* on p. 4.104 ff., the *1st Service Class* and *Network Standard* softkeys, and the standby and access probe power measurement described in section *Connection Control (Signal Off State)* on p. 4.36 ff., the *Connection (Alerting)* tab contains the following softkeys which lead to other services or signalling states (see *Figure 4-17* on p. 4.35):

- Deactivating the CMU's CDMA signal *(Signal Off)*
- *Disconnect MS* while keeping the CDMA signal *(BS Signal)* switched on (–> *Registered)*

Connect Control



System ID Number	2180
RF Channel	75
CDMA Power	- 50.00 dBm
RF Connector In	RF2
RF Ext. Att. In	10.0 dB
RF Connector Out	RF2
RF Ext. Att. Out	10.0 dB

The mobile is alerting, please accept the call at the mobile.

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Figure 4-21 Connect Control – Connection (Alerting)

The softkey *Signal Off* is described in section *Connection Control (Signal On State)* on p. 4.38 ff.

The parameter overview in the left half of the menu is also indicated in the other *Connection* tabs and is described in section *Connection Control with Connection Established* on p. 4.104 ff. Some parameters are not always available, depending on the current and previous signalling states and settings. In this case the table shows invalid or unavailable settings ("—").

Message box A message displayed in each *Connection* tab provides the current instrument state or indicates how to proceed to get to other signalling states. In this instance, the message `The mobile is alerting. Please accept the call at the mobile.` is displayed.

Disconnect UE

The *Disconnect UE* softkey releases the connection to the UE. The CMU changes to the signalling state *Registered*.

Remote control
`PROCedure:SIGNalling[CSWitched]:ACTion CREL`

Overview

The *Overview* main menu provides an overview of the function group *CDMA2000 Signalling*, the current measurement status, and the most important scalar parameters and measurement results.

Note: *The configuration settings made in the* Overview *application (with either the softkeys or the* Configuration *menus) apply only to the measurements presented here. For example, configuration settings made here do not affect the configuration settings made within the* Power *or* Modulation *applications.*

The Overview *measurement has its own environment (see Chapter 3, section* Measurement Environments*). If the measurement environment is enabled (see section Overview Configuration – Control on p. 4.47 ff.), it overrides the Connection Control parameters as long as the measurement is switched on (RUN) and a connection is established. All* Overview *measurement results are always obtained with the same parameter set.*

Refer to Table 4-4 *on page* 4.34 *for a list of measurements and their radio configuration requirements.*

Note: *The Overview measurement is available for both O-QPSK and H-PSK modulation schemes. The CMU automatically selects the correct modulation scheme unless this feature is disabled in the Misc. tab of the Connection Control menu. Refer to section Miscellaneous User Settings (Connection Control – Misc.) on p.* 4.142 *ff.*

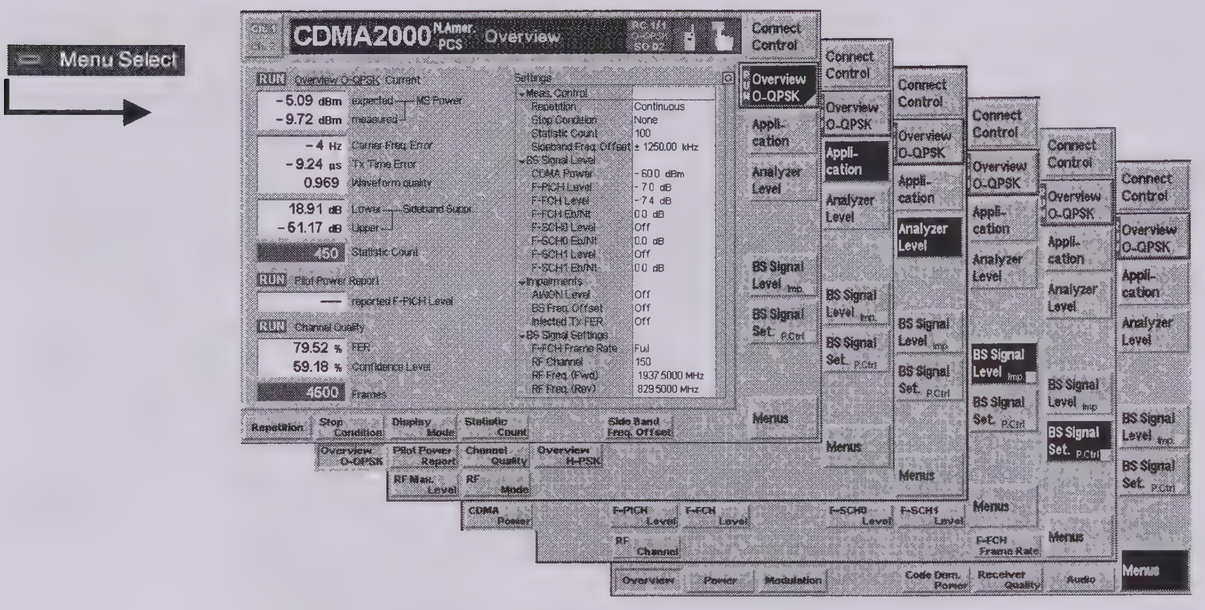
O-QPSK measurements require a reverse radio configuration setting of 1 or 2. H-PSK measurements require a reverse radio configuration setting of 2 or 3. Refer to Table 4-4 *on page* 4.34 *for a list of measurements and their radio configuration requirements.*

The screen shots and discussions in this chapter refer to O-QPSK but apply to both modulation schemes.

In the softkey bar on the right side, the *Analyzer/Generator* menu provides different types of softkeys:

- The measurement control softkey *Overview O-QPSK* changes to *Pilot Power Report, Channel Quality* or *Overview H-PSK,* depending on the application selected. This softkey controls the measurement, indicates its status *(RUN | HLT | OFF)* and opens the configuration menu *Overview Configuration*. The hotkeys associated to the measurement control softkey define the scope of the *Modulation* measurement.
- The other softkeys on the right side are combined with various hotkeys (e.g. the hotkeys *RF Max. Level* and *RF Mode* belong to the softkey *Analyzer Level).* The softkey/hotkey combinations provide test settings and switch over between different measurements.

The *Overview* menu is opened from the main menu *Menu Select* (with associated key at the front of the instrument). The hotkeys associated to the *Menus* softkey switch over between the *Overview* menu and the remaining measurement menus of function group *CDMA2000 Signalling*.



RUN Overview O-QPSK Current

-5.09 dBm expected – MS Power
-9.72 dBm measured
-4 Hz Carrier Freq. Error
-9.24 µs Tx Time Error
0.969 Waveform quality
18.91 dB Lower – Sideband Suppr.
-51.17 dB Upper
450 Statistic Count

RUN Pilot Power Report

--- reported F-PICH Level

RUN Channel Quality

79.52 % FER
59.18 % Confidence Level
4500 Frames

Settings

- Meas. Control
  - Repetition: Continuous
  - Stop Condition: None
  - Statistic Count: 100
  - Sideband Freq. Offset: ± 1250.00 kHz
- BS Signal Level
  - CDMA Power: -60.0 dBm
  - F-PICH Level: -7.0 dB
  - F-FCH Level: -7.4 dB
  - F-FCH Eb/Nt: 0.0 dB
  - F-SCH0 Level: Off
  - F-SCH0 Eb/Nt: 0.0 dB
  - F-SCH1 Level: Off
  - F-SCH1 Eb/Nt: 0.0 dB
- Impairments
  - AWGN Level: Off
  - BS Freq. Offset: Off
  - Injected Tx FER: Off
- BS Signal Settings
  - F-FCH Frame Rate: Full
  - RF Channel: 150
  - RF Freq. (Fwd): 1937.5000 MHz
  - RF Freq. (Rev): 829.5000 MHz

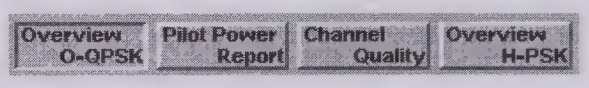
Figure 4-22 Overview menu

Softkey Selections

Each *Overview* application is controlled by means of the measurement control softkey below the *Connect. Control* softkey and the associated hotkeys. The properties of the measurement control softkey are analogous in all measurements; see section *Analyzer/Generator – Measurement Control* in the *Non Signalling* section. The remaining softkeys select the application and provide application-specific settings.

Application

The *Application* softkey displays the available measurement functions.



Each measurement type can be turned on or off by selecting the hotkey and pressing the *ON/OFF* key or halted by pressing the *CONT/HALT* key.

Remote Control The four applications of the *Overview* menu are is selected by the keywords `OVERview[:OQPSk]`, `PPOWer`, `CQUality` and `OVERview:HPSK` in the 4th level of the MODulation commands, e.g. `CONFigure:OVERview:PPOWer...`

Note: *The* Overview O-QPSK *measurements require a reverse Radio Configuration 1 or 2,* H-PSK *measurements a reverse Radio Configuration 3 or 4 see Table 4-4 on p.* 4.34.

Analyzer Level Trg.

The *Analyzer Level/Trigger* softkey toggles between two sets of hotkeys to control the level in the RF signal path and define the trigger settings. These general settings are provided in the *Analyzer* and *Trigger* tabs of the *Connection Control* menu; see section *Analyzer Control (Connection Control – Analyzer)* on p. 4.141 ff and *Trigger (Connection Control – Trigger)* on p. 4.139 ff.

BS Signal Level Imp.

The *BS Signal Level / Imp.* softkey toggles between two sets of hotkeys to adjust the signal impairments and the base station signal levels.

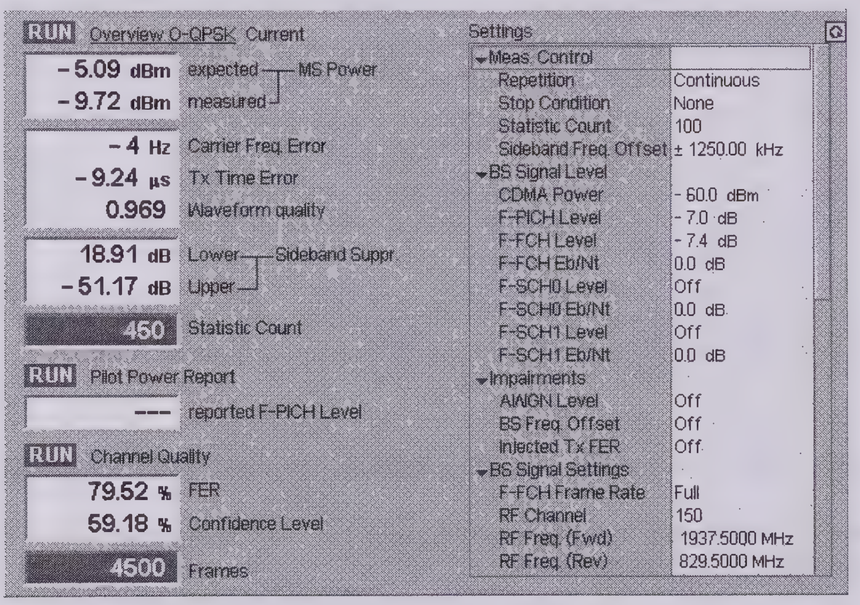
All settings belong to the *Overview* measurement environment. They are also provided in the *Overview Configuration* menu and described in section *Overview Configuration – Control* on p. 4.47 ff.

BS Signal Set. P. Ctrl

The *BS Signal Set. /P. Ctrl* softkey displays a set of hotkeys to adjust the RF channel and frame rate and the power control bits that the CMU sends to the mobile station to control its output power. *Frame Rate* and *Power Control Bits* belong to the *Overview* measurement environment and are also provided in the *Overview Configuration* menu (refer to section *Overview Configuration – Control* on p. 4.47 ff.). *RF Channel* is a general parameter; see p. 4.126.

Measurement Results

The *Overview* menu contains three groups of output fields reporting the measurements results and an overview of the current measurement settings.



RUN Overview O-QPSK Current

- 5.09 dBm expected — MS Power
- 9.72 dBm measured

- 4 Hz Carrier Freq. Error
- 9.24 µs Tx Time Error
0.969 Waveform quality

18.91 dB Lower — Sideband Suppr.
- 51.17 dB Upper

450 Statistic Count

RUN Pilot Power Report

--- reported F-PICH Level

RUN Channel Quality

79.52 % FER
59.18 % Confidence Level

4500 Frames

Settings

Meas. Control	
Repetition	Continuous
Stop Condition	None
Statistic Count	100
Sideband Freq. Offset	± 1250.00 kHz
BS Signal Level	
CDMA Power	- 60.0 dBm
F-PICH Level	- 7.0 dB
F-FCH Level	- 7.4 dB
F-FCH Eb/Nt	0.0 dB
F-SCH0 Level	Off
F-SCH0 Eb/Nt	0.0 dB
F-SCH1 Level	Off
F-SCH1 Eb/Nt	0.0 dB
Impairments	
AWGN Level	Off
BS Freq. Offset	Off
Injected Tx FER	Off
BS Signal Settings	
F-FCH Frame Rate	Full
RF Channel	150
RF Freq. (Fwd)	1937.5000 MHz
RF Freq. (Rev)	829.5000 MHz

Figure 4-23 Overview menu

The left side of the *Overview* menu reports the results of all *Overview* measurement applications:

Overview...

Overview O-QPSK (or H-PSK) Current (or *Average*, depending on the the *Display Mode* set in the *Control* tab of the *Overview Configuration* menu) displays the following power and modulation parameters:

- MS Power
- Carrier Frequency Error
- Transmit Time Error
- Waveform Quality
- Sideband Suppression
- Statistic Count

The *Overview...* measurement results are discussed under *Modulation Measurements* beginning on page 4.68.

The following values are not provided in the *Modulation* measurement:

Sideband Suppression

Sideband Suppression is a power measurement at a user-configurable offset frequency used for spurious measurements. In contrast to the *MS Power* the sideband suppression is measured with a 30 kHz (Gaussian) spectrum analyzer filter. The frequency offset is set via the *Side Band Freq. Offset* hotkey associated to the measurement control softkey.

Lower Sideband Suppr.	Ratio of the sideband power at *RF Frequency – Side Band Freq. Offset* to the *MS Power* in dB
Upper Sideband Suppr.	Ratio of the sideband power at *RF Frequency + Side Band Freq. Offset* to the *MS Power* in dB

Note: *In remote control the lower and upper sideband suppression can be measured at up to 4 different frequencies; see keywords* `...ACP1` *to* `...ACP4`.

Remote Control

```
READ[:SCALar]:OVERview:OVERview:<Modulation>?
FETCh[:SCALar]:OVERview:OVERview:<Modulation>?
SAMPle[:SCALar]:OVERview:OVERview:<Modulation>?
```

Pilot Power Report

Pilot Power Report displays the current F-PICH pilot power reported from the mobile

The *Pilot Power Report* measurement results are discussed under *Power Measurements* beginning on page 4.52.

Remote Control

```
READ[:SCALar]:OVERview:OVERview:<Modulation>?
FETCh[:SCALar]:OVERview:OVERview:<Modulation>?
SAMPle[:SCALar]:OVERview:OVERview:<Modulation>?
```

Channel Quality

Channel Quality starts the Receiver Quality measurement and displays the frame error rate and the number of frames transmitted in the current measurement.

The *Channel Quality* measurement results are discussed under *Receiver Quality Measurements* beginning on page 4.95.

Remote Control

```
READ[:SCALar]:OVERview:OVERview:<Modulation>?
FETCh[:SCALar]:OVERview:OVERview:<Modulation>?
SAMPle[:SCALar]:OVERview:OVERview:<Modulation>?
```

Settings

The *Settings* table displays the current configuration settings as defined in the *Overview Configuration* menu (see section *Overview Configuration* on p. 4.47 ff.).

Remote Control

Settings are retrieved using the query corresponding to the setting command (setting command with appended question mark).

Limit Check

A red output field and an arrow pointing upwards or downwards indicates that the measurement result exceeds the upper or lower limit set in the *Limits* tab of the *Power Configuration* menu; see section *Overview Configuration – Limits* on p. 4.51 ff. No limit check is provided for the *Pilot Power Report.*

Remote Control

`CALCulate[:SCALar]:<Application>:MATChing:LIMit?`

Overview Configuration

The popup menu *Overview Configuration* contains tabs to define the parameters of the modulation measurements and the limits (error tolerances).

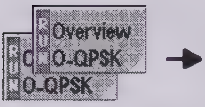
Pressing the measurement softkey twice (once if already selected) opens the popup menu *Overview Configuration*. Press the associated hotkeys to change between tabs. Use the roll-key to expand or compress the list of settings displayed.

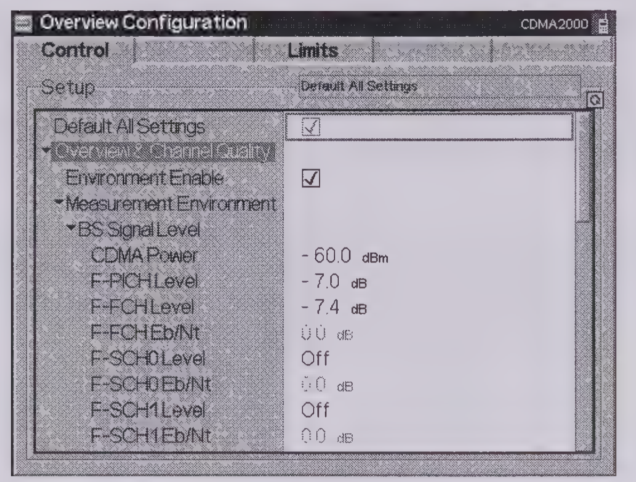
Note: *The Overview application is available for both O-QPSK and H-PSK modulation schemes. The CMU automatically selects the correct modulation scheme unless this feature is disabled in the Misc. tab of the Connection Control menu. Refer to section Miscellaneous User Settings (Connection Control – Misc.) on p. 4.142 ff.*

The screen shots and discussions in this chapter refer to O-QPSK but apply to both modulation schemes.

Overview Configuration – Control

The *Control* tab controls the modulation measurement applications. The menus contain configurations that affect all *Overview* applications (i.e. the measurement environment settings) and settings for individual *Overview* applications.





Setup: Default All Settings

Default All Settings	☑
Overview 2 Channel Quality	
Environment Enable	☑
Measurement Environment	
BS Signal Level	
CDMA Power	- 60.0 dBm
F-PICH Level	- 7.0 dB
F-FCH Level	- 7.4 dB
F-FCH Eb/Nt	0.0 dB
F-SCH0 Level	Off
F-SCH0 Eb/Nt	0.0 dB
F-SCH1 Level	Off
F-SCH1 Eb/Nt	0.0 dB

Figure 4-24 Overview Configuration – Control

Default All Settings The *Default All Settings* switch assigns default values to all settings in the *Control* tab (the default values are quoted in the command description in chapter 6 of this manual). In addition, default switches for the individual applications are provided.

Remote control
`DEFault:OVERview:<Application>:CONTrol ON | OFF`

Environment Enable *Environment Enable* enables or disables the *Overview* environment:

On (box checked) The parameters listed in the *Measurement Environment* section are used as soon as a connection is established and an *Overview* measurement application is switched on.

Off (box unchecked) The *Measurement Environment* settings are ignored; the CMU always uses the corresponding *Connection Control* settings.

Note: *In the Misc. tab of the Connection Control menu, it is possible to enable or disable all measurement environments; see section Miscellaneous User Settings (Connection Control – Misc.) on p. 4.142 ff.*

Remote control
`CONFigure:OVERview:MCQuality:ENVironment:ENABle ON | OFF`

Measurement Environment The *Measurement Environment* section contains all parameters that affect all *Overview* applications and form the measurement environment. The settings take effect if the environment is enabled (see above). All settings have an equivalent in the *BS Signal* or *Service Cfg.* tab of the *Connection Control* menu; see section *Signals of the CMU (Connection Control – BS Signal)* on p. 4.126 ff.

Remote Control The commands of the *Overview* measurement application are analogous to the corresponding *BS Signal* commands. The keyord `:BSSignal` is replaced by `OVERview:MCQuality:ENVironment`, e.g.:
`CONFigure:OVERview:MCQuality: ENVironment:POWer:CDMA <CDMA Power>`

BS Signal Level Sets the levels of the forward CDMA2000 signal of the CMU.

Impairments	Sets parameters to impair the forward CDMA2000 signal of the CMU in order to simulate realistic propagation conditions and test the MS receiver.
BS Signal Settings	Sets the *F-FCH Frame Rate* to Full, Half, Quarter, or Eighths. The frame rate hs an equivalent in the *Service Cfg.* tab of the *Connection Control* menu; see section *Service Configuration of the CMU (Connection Control – Service Cfg.)* on p. 4.108 ff.
Power Control	*Power Control Bits* defines the power control bit sequence that the CMU sends to the mobile station to control its output power.

O-QPSK Overview Meas.

Repetition

Repetition determines the repetition mode as described below.

Single Shot:	The measurement is stopped after a statistic cycle, i.e. after the number of waveform intervals/evaluation periods set in the configuration menu *Statistics*. The *Stop Condition* setting may stop the measurement before completion of a cycle. A stopped measurement is indicated by the status display *HLT* in the measurement softkey. Single shot should be selected only if a single measurement result is required under fixed conditions.
Continuous:	The CMU continues the measurement until it is terminated explicitly or until the stop condition is met. The measurement results are valid after one statistic cycle; however, the measurement is continued, and the output is continuously updated. An ongoing measurement is indicated by the status display *RUN* in the measurement softkey. The continuous measurement is suitable for monitoring the evolution of a measured quantity in time, for example when performing adjustments.

Note: *In remote mode, the counting measurement (counting mode) is available as a further measurement mode with a defined number of measurement cycles to be performed, refer to Chapter 6 of this manual.*

The Stop Condition setting can affect the Single Shot and Continuous repetition modes.

Remote Control

`CONFigure:OVERview:OVERview[:OQPSk]:CONTrol:REPetition`
`CONFigure:OVERview:OVERview:HPSK:CONTrol:REPetition`
`<Repetition>, <Stop Cond>, <Step Mode>`

Stop Condition

Stop Condition selects one of two stop conditions for the measurement:

NONE	The measurement continues even if tolerances are exceeded.
On Limit Failure	The measurement is stopped when a tolerance is exceeded.

Note: *The Stop Condition setting can affect the Single Shot and Continuous repetition modes.*

Remote Control
See *Repetition* above.

Statistic Count
Statistic Count defines the length of the statistic cycles in waveform intervals/evaluation periods.

1 to 1000	Number of intervals per statistic cycle.

Remote Control
```
CONFigure:OVERview:OVERview[:OQPSk]:CONTrol:STATistics
CONFigure:OVERview:OVERview:HPSK:CONTrol:STATistics
<Statistic Count>
```

Display Mode
The *Display Mode* field defines which of the four measured and calculated statistical measurement results is displayed. The measurement results differ in the way the waveform interval Modulation *p(t)* at a fixed point in time *t* is calculated if the measurement extends over several waveform intervals; see also Chapter 3, section *General Settings:*

Current	Measured value for current waveform interval
Minimum/Maximum	Extreme value of a number of waveform intervals
Average	Average value over a number of waveform intervals

The number of waveform intervals for calculation of the statistical values *Minimum/Maximum* and *Average* – and thus the result – depends on the repetition mode set. In detail, this implies:

Single shot	Display of minimum/maximum and average value from the performed statistics cycle.
Continuous	Display of minimum/maximum from all waveform intervals already measured. The **average value**, however, is calculated according to the rule in Chapter 3, section *General Settings*.

Remote Control
No display mode set, the `READ...`, `FETCh...` and `SAMPle` commands retrieve all values.

Sideband Freq Offset
The *Side Band Freq. Offset* input field sets the frequency offset used for the *Sideband Suppression* power measurement; see section *Measurement Results* on p. 4.45 ff. The sideband suppression is measured at the two offset frequencies symmetrical to the *RF Frequency* (lower and upper sideband suppression).

In remote control up to 4 different frequency offsets can be defined so that up to 8 symmetrical sideband suppression values are available:
`CONFigure:OVERview:OVERview:<Application>:CONTrol:FOFFset:SBSuppress:ACP<nr>`, where <nr> = 1 to 4

H-PSK Overview Meas
Refer to O-QPSK above for a description of the available settings.

Channel Quality
Refer to O-QPSK above for a description of the *Repetition* mode.

Stop Condition	*Stop Condition* selects one of several stop conditions for the measurement:	
	NONE	Continue the measurement even in the event of errors.
	Confidence Limit Exceeded:	Stop the measurement when the confidence level exceeds the set limit. This indicates the probability that the true FER is less than the set FER limit.
	Frame Limit Exceeded:	Stop the measurement when the number of frame errors exceed the set limit.
	Any Limit Exceeded:	Stop the measurement if either the *Confidence Limit* or *Frame Limit* is exceeded.
	The stop conditions may affect single-shot and continuous measurement settings.	

Remote Control `CONFigure:OVERview:CQUality:CONTrol:REPetition` *`<Repetition>, <Stop Cond>, <Step Mode>`*

Max Frames The *Max Frames* sets the maximum number of frames used to calculate the frame error rate.

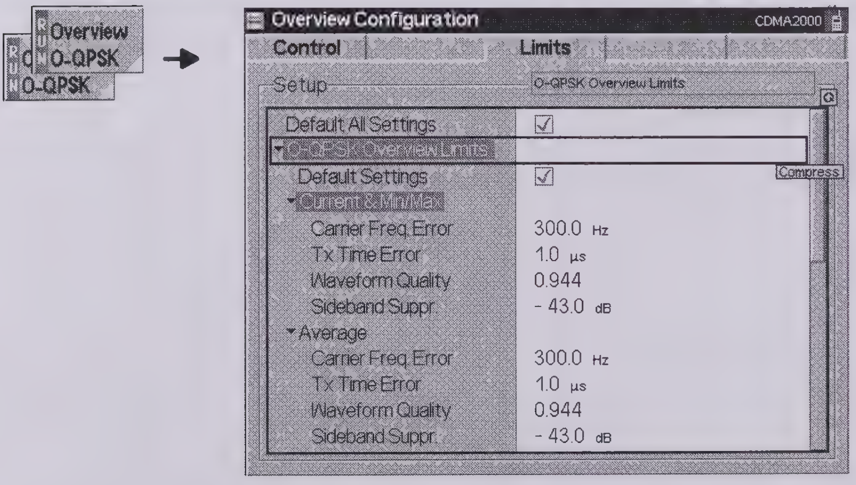
Remote Control `CONFigure:OVERview:CQUality:CONTrol:FRAMes` *`<Max Frames>`*

Overview Configuration – Limits

The *Limits* tab allows you to set the limits for the *Overview* applications. Two sets of limits are configurable for the *O-QPSK Overview* and *H-PSK Overview* application: the *Current and Maximum/Minimum* measurement limits and the *Average* measurement limits. In addition the *Limits* tab provides the limits for the *Channel Quality* application. No limit check is available for the *Pilot Power Report.*

Note: *The Overview application is available for both O-QPSK and H-PSK modulation schemes. The CMU automatically selects the correct modulation scheme unless this feature is disabled in the Misc. tab of the Connection Control menu. Refer to section Miscellaneous User Settings (Connection Control – Misc.) on p.* 4.142 *ff.*

The screen shots and discussions in this chapter refer to O-QPSK but apply to both modulation schemes.



Default All Settings	☑
O-QPSK Overview Limits	
Default Settings	☑
Current & Min/Max	
Carrier Freq Error	300.0 Hz
Tx Time Error	1.0 µs
Waveform Quality	0.944
Sideband Suppr.	- 43.0 dB
Average	
Carrier Freq Error	300.0 Hz
Tx Time Error	1.0 µs
Waveform Quality	0.944
Sideband Suppr.	- 43.0 dB

Figure 4-25 Overview Configuration – Limits

Default All Settings

The *Default All Settings* switch assigns default values to all parameters of the *Limits* tab. The default values are quoted in the command description in chapter 6 of this manual. In addition, default switches for the individual applications (except the *Pilot Power Report)* are provided.

Remote control

```
DEFault:OVERview:<Application>:LIMit  ON | OFF
```

The following limits are provided for the ***O-QPSK Overview*** and ***H-PSK Overview*** applications:

Current & Min/Max

Current and Max/Min sets the limits for the measured values in the current waveform interval or of the extreme values of all measured waveform intervals *(Min/Max).*

Remote control

```
CONFigure:OVERview:<Application>:CMMax:LIMit[:SCALar]:SYMMetric
[:COMBined]:VALue
CONFigure:OVERview:<Application>:CMMax:LIMit[:SCALar]:SYMMetric
[:COMBined]:ENABle
CONFigure:OVERview:<Application>:CMMax:LIMit[:SCALar]:SYMMetric
[:COMBined]
```

Average

Average sets the limits are for the average value of the measured values obtained according to the averaging rules of Chapter 3, section *General Settings.*

Remote control

```
CONFigure:OVERview:<Application>:AVERage:LIMit[:SCALar]:SYMMetric
[:COMBined]:VALue
CONFigure:OVERview:<Application>:AVERage:LIMit[:SCALar]:SYMMetric
[:COMBined]:ENABle
CONFigure:OVERview:<Application>:AVERage:LIMit[:SCALar]:SYMMetric
[:COMBined]
```

Channel Quality

The results of the ***Channel Quality*** application are always *Current* results, so only one set of limits parameters is provided:

Remote control

```
CONFigure:OVERview:CQUality:CAMMax:LIMit:MFER
CONFigure:OVERview:CQUality:CAMMax:LIMit:CLEVel
```

Power Measurements

The menu group *Power* contains the functions to measure the received signal power. The *Power Configuration* popup menu configures all power measurements.

The *Power* menu is opened from the *Menu Select* menu or from any other measurement menu in *CDMA2000 Signalling* using the hotkey *Menu – Power* (see Figure 4-26). The initial screen returns to the power application last accessed.

In the softkey bar on the right side, the *Power* menu provides different types of softkeys:

- The measurement control softkey *Mod. Qual. O-QPSK* changes to *Mod. Qual. H-PSK* or *Mod. Qual. QPSK,* depending on the application selected. This softkey controls the measurement, indicates its status *(RUN | HLT | OFF)* and opens the configuration menu *Modulation Configuration*. The hotkeys associated to the measurement control softkey define the scope of the *Modulation* measurement.
- The other softkeys on the right side are combined with various hotkeys (e.g. the hotkeys *RF Max. Level* and *RF Mode* belong to the softkey *Analyzer Level)*. The softkey/hotkey combinations provide test settings and switch over between different measurements.

Note: *The configuration settings made in the* Power *applications (with either the softkeys or the* Configuration *menus) apply only to the measurements presented here. For example, configuration settings made here do not affect the configuration settings made within the* Overview *or* Modulation *applications.*

All applications in the Power *measurement except* NPower*have their own environment (see Chapter 3, section* Measurement Environments)*. If the measurement environment is enabled in the configuration menu (see description in section Power Configuration – Control on p. 4.62 ff.), it overrides the Connection Control parameters as long as the measurement is switched on (RUN) and a connection is established. All* Power *measurement results are always obtained with the same parameter set.*

The Power Control Bits for the Min. Power and Max. applications are fixed, so that the mobile transmits at its minimum or maximum output power. Disabling the environments for these applications causes the fixed Power Control Bits to be overwritten. This may change the mobile transmitter output power and cause misleading results.

Refer to Table 4-4 *on page* 4.34 *for a list of measurements and their radio configuration requirements.*

Filter settings for power measurements

The CMU measures and displays different MS transmitter output power results, acquired with different MS operating conditions and different measurement methods.

Most of the power measurements are performed using the baseband receiver filter specified in standard TIA/EIA/IS-2000.2-A. In particular, this holds for all results displayed in the *Power* menu. In *Signalling* mode, the power results listed in the table below are obtained with different measurement filters.

Table 4-5 Filer settings for power measurements (Signalling)

Value	Menu	Filter
Wideband Power	Connection Control, AF/RF ↻ (see p. 4.38)	Wideband measurement
Sideband Suppression	Overview, see section *Measurement Results* on p. 4.45 ff.	30 kHz (Gaussian) spectrum analyzer filter
ACP	Spectrum, see section *Measurement Results* on p. 4.79 ff.	30 kHz (Gaussian) spectrum analyzer filter
Standby power	Connection Control, Connection see section *Connection Control (Signal On State)* on p. 4.38 ff.	1 MHz filter according to standard IS-98-D

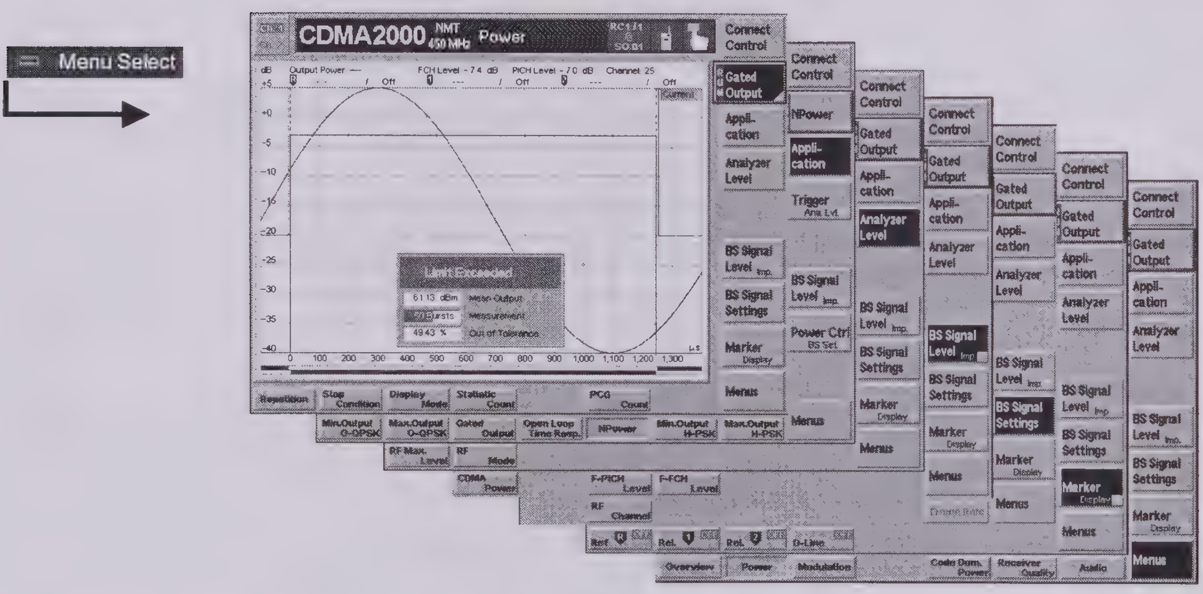


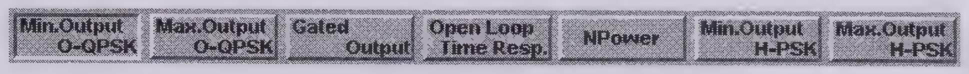
Figure 4-26 Power measurement menu (Gated Output displayed)

Softkey Selections

Each *Power* application is controlled by means of the measurement control softkey below the *Connect. Control* softkey and the associated hotkeys. The properties of the measurement control softkey are analogous in all measurements; see section *Analyzer/Generator – Measurement Control* in the *Non Signalling* section. The remaining softkeys select the application and provide application-specific settings.

Appli-cation

The *Application* softkey activates a set of hotkeys to select a power measurement. When an application is selected, the corresponding measurement screen is displayed.



Note: *The Power O-QPSK measurements require a reverse Radio Configuration 1 or 2, H-PSK measurements a reverse Radio Configuration 3 or 4; see Table 4-4 on p. 4.34. The Gated Output Power can be measured with reverse Radio Configuration 1 or 2, the Open Loop Time Response with reverse Radio Configuration 1, 2, 3 or 4.*

Min. Output O-QPSK

The *Minimum Output O-QPSK* hotkey changes the power measurement application to measure the minimum power output of the mobile station for the Offset Quadrature Phase Shift Keying modulation scheme.

Remote Control

The *Min. Output QPSK* application is selected by the keywords `MIOutput[:OQPSk]` in the 3rd and 4th level of the `POWer` commands, e.g. `CONFigure:POWer:MIOutput[:OQPSk]...`

Max. Output O-QPSK

The *Maximum Output O-QPSK* hotkey changes the power measurement application to measure the maximum power output of the mobile station for the Offset Quadrature Phase Shift Keying modulation scheme.

Remote Control

The *Min. Output O-QPSK* application is selected by the keywords `MAOutput[:OQPSk]` in the 3rd and 4th level of the `POWer` commands, e.g. `CONFigure:POWer:MAOutput[:OQPSk]...`

Open Loop Time Resp.

The *Open Loop Time Resp.* hotkey changes the power measurement application to measure the open loop power control time response to an increase or decrease of the total base station power.

Remote Control

The *Open Loop Time Resp.* application is selected by the keywords `OLTResponse` in the 3rd level of the `POWer` commands, e.g. `CONFigure:POWer:OLTResponse...`

Gated Output

The *Gated Output* hotkey changes the power measurement to display the time response of the mean output power for isolated gated-on power control groups.

Remote Control

The *Gated Output* application is selected by the keywords `GOUTput` in the 3rd level of the `POWer` commands, e.g. `CONFigure:POWer:GOUTput...`

NPower

The *NPower* hotkey changes the power measurement to display the average, minimum and maximum power of an RF input signal in an evaluation period of variable length plus a statistical evaluation over several periods. NPower is identical to the *Power* measurement in *Non Signalling* mode.

Remote Control

The *NPower* application is selected by the keyword `NPOWer` in the 2nd level of the commands, e.g. `CONFigure:NPOWer...` **No additional `POWer` keyword is needed.**

Min. Output H-PSK

The *Minimum Output H-PSK* hotkey changes the power measurement application to measure the minimum power output of the mobile station for the Hybrid Phase Shift Keying modulation scheme.

Remote Control

The *Min. Output H-PSK* application is selected by the keywords `MIOutput:HPSK`

in the 3rd and 4th level of the `POWer` commands, e.g.
`CONFigure:POWer:MIOutput:HPSK...`

Max. Output H-PSK

The *Maximum Output H-PSK* hotkey changes the power measurement application to measure the maximum power output of the mobile station for the Hybrid Phase Shift Keying modulation scheme.

Remote Control

The *Max. Output H-PSK* application is selected by the keywords `MAOutput:HPSK` in the 3rd and 4th level of the `POWer` commands, e.g.
`CONFigure:POWer:MAOutput:HPSK...`

Analyzer Level Trg.

The *Analyzer Level/Trigger* softkey toggles between two sets of hotkeys to control the level in the RF signal path and define the trigger settings. These general settings are provided in the *Analyzer* and *Trigger* tabs of the *Connection Control* menu; see section *Analyzer Control (Connection Control – Analyzer)* on p. 4.141 ff and *Trigger (Connection Control – Trigger)* on p. 4.139 ff.

BS Signal Level Imp.

The *BS Signal Level / Imp.* softkey toggles between two sets of hotkeys to adjust the signal impairments and the base station signal levels.

All settings belong to the *Power* measurement environment. They are also provided in the *Power Configuration* menu and described in section *Power Configuration – Control* on p. 4.62 ff.

BS Signal Set. P. Ctrl

The *BS Signal Set. /P. Ctrl* softkey displays a set of hotkeys to adjust the RF channel and frame rate and the power control bits that the CMU sends to the mobile station to control its output power. *Frame Rate* and *Power Control Bits* belong to the *Power* measurement environment and are also provided in the *Power Configuration* menu (refer to section *Power Configuration – Control* on p. 4.62 ff.). *RF Channel* is a general parameter; see p. 4.126.

Marker Display

The *Marker/Display* softkey positions up to three markers and a baseline (D-Line) in the test diagram and outputs their values. Refer to page 4.145 for detailed information about markers.

The softkey is only available for applications providing a graphical diagram, i.e. for *Open Loop Time Resp.* and *Gated Output.* The following hotkeys are associated to the *Display/Marker* version of the softkey (press twice) and configure the diagram in the *Gated Output* application.

Display Area

The *Display Area* hotkey selects the full diagram width for display or zooms in on a particular section.

Full Display	Show full diagram width: –100 µs to +1400 µs relative to the start of the gated-on time interval.
Rising Edge	Zoom in on the rising edge: –50 µs to +50 µs relative to the start of the gated-on time interval.
Falling Edge	Zoom in on the falling edge: +1200 µs to +1300 µs relative to the start of the gated-on time interval.

Limit Ref. Lines

Limit Ref. Lines switches the limit reference lines (green, vertical, dotted lines) in the diagram on or off. The limit reference lines can be used to change the 0-µs time reference of the x-axis; see section *Modulation Configuration – Limits* on p. 4.75 ff.

Remote Control No commands; display configuration only.

Menus The *Menus* softkey displays the hotkey bar for switching to the other measurement menus.

Measurement Results

The CMU measures power by calculating the average power over a measurement interval. The measurement interval is 1229.5 chip intervals (0.5 ms).

- The *Minimum Output* application measures the mobile station's minimum output power. The screen displays a table of the measured values of the total channel power and the waveform quality of the signal.
- The *Maximum Output* application measures the mobile station's maximum output power. The screen displays a table of the measured values of the total channel power and the waveform quality of the signal.
- The *Open Loop Time Response* application measures the open loop power control time response to an increase or decrease of the total base station power.
- The *Gated Output* application measures the time response of the mean output power for isolated gated-on power control groups.
- The *NPower* application provides the average, minimum and maximum power of an RF input signal in an evaluation period of variable length plus a statistical evaluation over several periods. It is identical to the *Power* measurement in Non Signalling mode.

Measurement results are explained for each application. For the *NPower* results refer to section *Non Signalling – Power Measurements.*

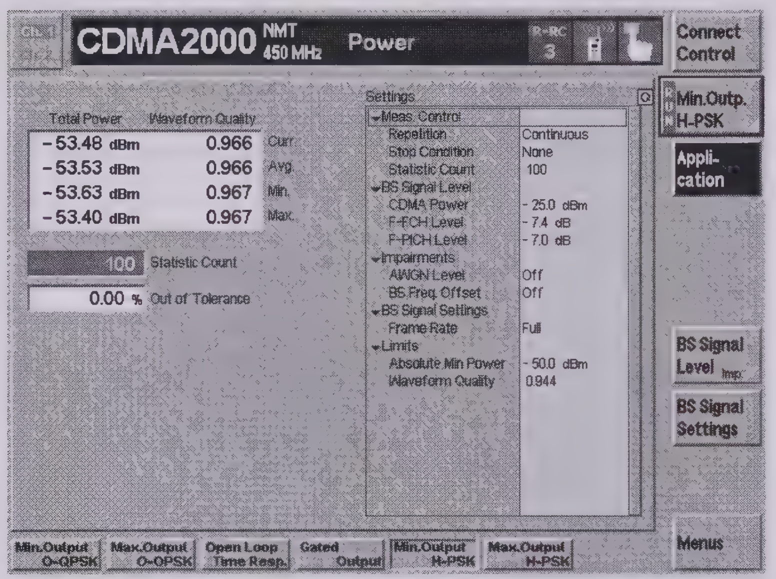
Minimum Output

The *Minimum Output* application is available for both O-QPSK and H-PSK modulation schemes. The screen shots and discussions refer to O-QPSK but apply to both modulation schemes.

The *Minimum Output* application instructs the mobile station to reduce its output power to its minimum level. (This is in part done by setting the power control bits to the All Down mode.) The screen displays four measured values of the total channel power and the waveform quality of the signal. The application uses the values selected for CDMA Power, Traffic Level, and Pilot Level accessed either by the *BS Signal Level* softkey or in the *Control* tab of the *Power Configuration* menu.

The following values are returned for Total Power and Waveform Quality:

- Current is the current values of the measurement interval.
- Maximum and Minimum are the extreme values (and their polarity) of the power of all measurement intervals since the measurement started. Waveform quality measurements of the minimum and maximum power measurements are made at the time of the extreme values.
- Average is the value of a number of measurement intervals averaged together (defined by the *Statistic Count* setting).
- Waveform Quality is the modulation accuracy of the transmitted signal. The waveform quality is obtained by comparing the transmitted signal to an ideal O-QPSK/H-PSK signal as defined in standard TIA/EIA-98.



Total Power	Waveform Quality	
-53.48 dBm	0.966	Curr.
-53.53 dBm	0.966	Avg.
-53.63 dBm	0.967	Min.
-53.40 dBm	0.967	Max.

100 Statistic Count

0.00 % Out of Tolerance

Settings

Meas. Control	
Repetition	Continuous
Stop Condition	None
Statistic Count	100
BS Signal Level	
CDMA Power	- 25.0 dBm
F-FCH Level	- 7.4 dB
F-PICH Level	- 7.0 dB
Impairments	
AWGN Level	Off
BS Freq. Offset	Off
BS Signal Settings	
Frame Rate	Full
Limits	
Absolute Min Power	- 50.0 dBm
Waveform Quality	0.944

Figure 4-27 Measurement menu Power – Minimum Output

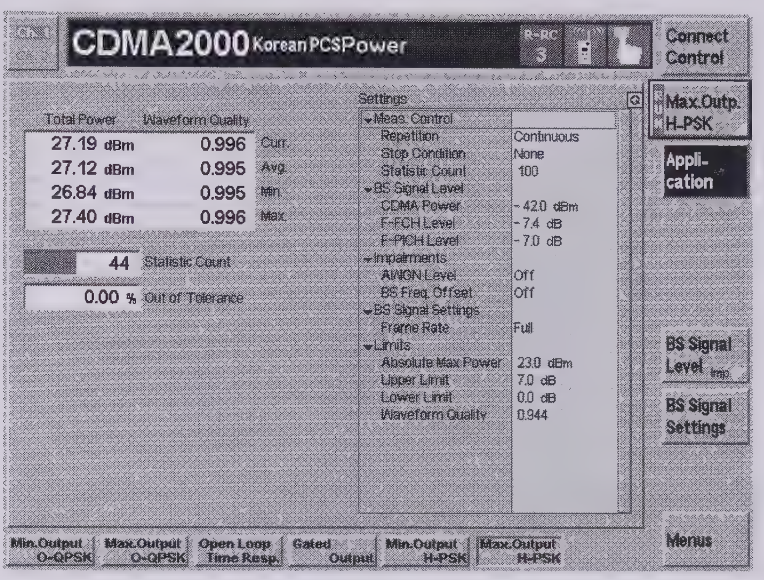
Maximum Output

The *Maximum Output* application is available for both O-QPSK and H-PSK modulation schemes. The screen shots and discussions refer to O-QPSK but apply to both modulation schemes.

The *Maximum Output* application instructs the mobile station to increase its output power to its maximum level. The screen displays four measured values of the total channel power and the waveform quality of the signal. The application uses the values selected for CDMA Power, Traffic Level, and Pilot Level accessed either by the *BS Signal Level* softkey or in the *Control* tab of the *Power Configuration* menu.

The following values are returned for Total Power and Waveform Quality:

- Current is the current values of the measurement interval.
- Maximum and Minimum are the extreme values (and their polarity) of the power of all measurement intervals since the measurement started. Waveform quality measurements of the minimum and maximum power measurements are made at the time of the extreme values.
- Average is the value of a number of measurement intervals averaged together (defined by the *Statistic Count* setting).
- Waveform Quality is the modulation accuracy of the transmitted signal. The waveform quality is obtained by comparing the transmitted signal to an ideal O-QPSK/H-PSK signal as defined in standard TIA/EIA IS-2000.



Total Power	Waveform Quality	
27.19 dBm	0.996	Curr.
27.12 dBm	0.995	Avg.
26.84 dBm	0.995	Min.
27.40 dBm	0.996	Max.

44 Statistic Count

0.00 % Out of Tolerance

Settings

Meas. Control	
Repetition	Continuous
Stop Condition	None
Statistic Count	100
BS Signal Level	
CDMA Power	- 42.0 dBm
F-FCH Level	- 7.4 dB
F-PICH Level	- 7.0 dB
Impairments	
AWGN Level	Off
BS Freq. Offset	Off
BS Signal Settings	
Frame Rate	Full
Limits	
Absolute Max Power	23.0 dBm
Upper Limit	7.0 dB
Lower Limit	0.0 dB
Waveform Quality	0.944

Measurement softkey

Figure 4-28 Measurement menu Power – Maximum Output

Open Loop Time Response

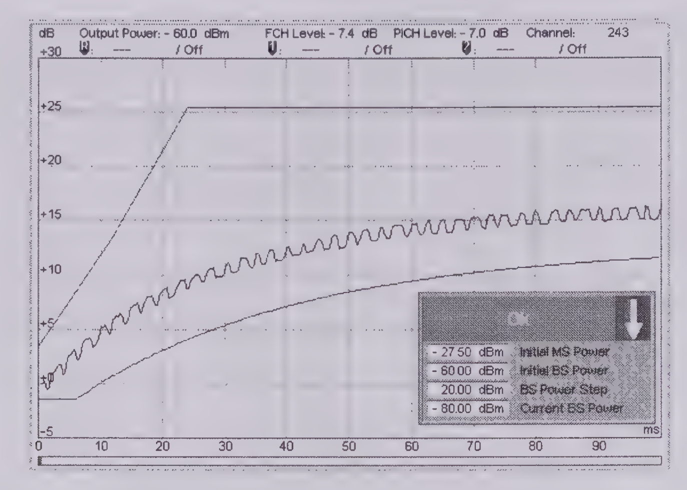
The *Open Loop Time Response* application is available for both O-QPSK and H-PSK modulation schemes. The screen shots and discussions refer to O-QPSK but apply to both modulation schemes.

The Open Loop Time Response application measures the open loop power control time response to an increase or decrease of the total base station power. The power step direction is set with either the *Power Stepping* softkey or in the *Power Configuration* menu in the *Control* tab. The template used for this measurement meets the requirements set in Standard TIA/EIA-98-D for Open Loop Time Response measurements.

Pressing the *ENTER (CONT/HALT)* starts the measurement. The measurement begins using the Initial BS Power setting then steps the power (up or down, depending on the configuration) using the defined BS Power Step parameter. When the measurement is done, the measurement halts and the BS Power is returned to the Initial BS Power setting.

The measurement screen for Open Loop can be divided into three groups:

- Scalar measurement results (parameter lines)
- Graph (a trace plotted as a function of time)
- Info Box (displaying measurements)



dB Output Power: - 60.0 dBm FCH Level: - 7.4 dB PICH Level: - 7.0 dB Channel: 243

+30 R: --- / Off 1: --- / Off 2: --- / Off

- 27.50 dBm Initial MS Power
- 60.00 dBm Initial BS Power
20.00 dBm BS Power Step
- 80.00 dBm Current BS Power

Parameter lines 1 and 2

Measurement graph

Info box

Figure 4-29 Measurement results (Open Loop)

Parameter Lines Scalar measurement results and settings are indicated in the two parameter lines above the test diagram and in the info box (a popup window in the middle of the graphical screen).

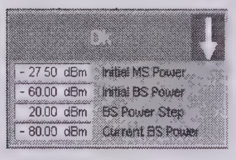
1st Line The first parameter line contains the following settings:

Output Power	Total output power of the CMU, calculated as the sum of the forward CDMA power and the AWGN Level; see
FCH Level	FCH level as set by means of the *BS Signal Level* softkey
PICH Level	PICH level as set by means of the *BS Signal Level* softkey

2nd Line The second parameter line contains the following marker values:

R	Level and time of reference marker
1	Level and time of marker 1 (setting *absolute*) and/or difference from reference marker (setting *relative*)
2	Level and time of marker 2 (setting *absolute*) and/or difference from reference marker (setting *relative*)

Info Box



- 27.50 dBm Initial MS Power
- 60.00 dBm Initial BS Power
20.00 dBm BS Power Step
- 80.00 dBm Current BS Power

The info box contains measurements concerning the open loop time response application. The arrow indicates the direction of the next power step. If a parameter exceeds its set limits, the info box turns red and displays the parameter exceeded and the current setting of that parameter.

Remote control Settings are read out using the query form of the setting command.

Measurement Graph The Measurement graph is displayed as a continuous curve together with the limit lines and all active markers. The template used for this measurement meets the requirements set in Standard TIA/EIA-98-D for Open Loop Time Response measurements.

The graph in each measurement shows the current power as a function of time.

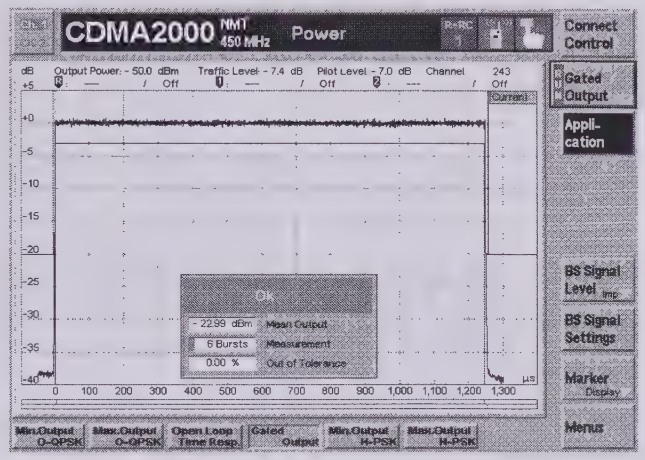
Gated Output

The *Gated Output* application measures the time response of the mean output power for isolated gated-on power control groups.

Note: *To ensure that the mobile station's output signal is gated, establish a connection with Reverse Radio Configuration 1 or 2.*

The measurement screen for Gated Output can be divided into two groups:

- Scalar measurement results (parameter lines)
- Graph (a trace plotted as a function of time)


Parameter lines 1 and 2

Measurement graph

Info box

CDMA2000 NMT 450 MHz Power

Output Power: - 50.0 dBm / Off

Traffic Level: - 7.4 dB / Off

Pilot Level: - 7.0 dB / Off

Channel 243

Ok

- 22.99 dBm Mean Output

6 Bursts Measurement

0.00 % Out of Tolerance

Figure 4-30 Display of measurement results (Gated Output screen)

Parameter Lines Scalar measurement results and settings are indicated in the two parameter lines above the test diagram and in the info box (a popup window in the middle of the graphical screen). The parameter lines show the same results as the *Open Loop* parameter lines; see section *Open Loop Time Response* on p. 4.59 ff.

Info Box

The info box displays measurements concerning the gated output application. If any parameter exceeds the set limits, the info box turns red.

Remote Control
`READ[:SCALar]:POWer:GOUTput?`
`FETCh[:SCALar]:POWer:GOUTput?`
`SAMPle[:SCALar]:POWer:GOUTput?`

Measurement Graph The *Measurement graph* is displayed as a continuous curve together with the limit lines, the reference lines and all active markers. The reference lines can be switched off in the *Limits* tab of the *Power Control* menu. They are also used to modify the time reference of the diagram; see section *Power Configuration – Limits* on p. 4.65 ff.

The graph in each measurement shows the respective measured power as a function of time.

The measured power is evaluated with 64 chips (i.e. 52 µs) before and after the actual isolated Power Control Group (PCG). Considering an oversampling factor of 1, a total of 64 + 1536 + 64 = 1664 valid samples is returned.

Remote Control

```
READ:ARRays:POWer:GOUTput:CURRent?
READ:ARRays:POWer:GOUTput:AVERage?
READ:ARRays:POWer:GOUTput:MINimum?
READ:ARRays:POWer:GOUTput:MAXimum?
FETCh:ARRays:POWer:GOUTput:CURRent?
FETCh:ARRays:POWer:GOUTput:AVERage?
FETCh:ARRays:POWer:GOUTput:MINimum?
FETCh:ARRays:POWer:GOUTput:MAXimum?
SAMPle:ARRays:POWer:GOUTput:CURRent?
SAMPle:ARRays:POWer:GOUTput:AVERage?
SAMPle:ARRays:POWer:GOUTput:MINimum?
SAMPle:ARRays:POWer:GOUTput:MAXimum?
```

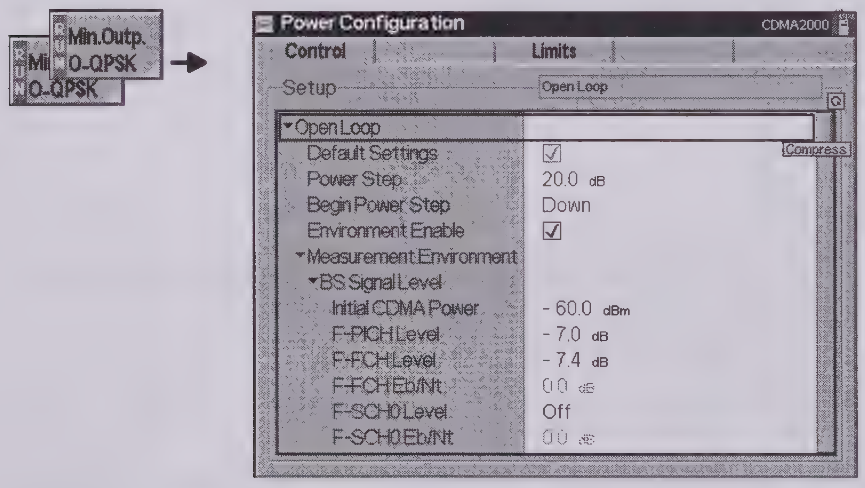
Power Configuration

The popup menu *Power Configuration* contains tabs to define the parameters of each power measurement.

Pressing the power measurement softkey twice (once if already selected) opens the popup menu *Power Configuration*. Use the hotkeys at the bottom of the screen to change between the tabs. Use the roll-key to expand or compress the list of displayed settings.

Power Configuration – Control

The *Control* tab controls each of the power measurement applications. Each application lists the available settings for controlling the measurement.



Setup	Open Loop
▾Open Loop	
Default Settings	☑
Power Step	20.0 dB
Begin Power Step	Down
Environment Enable	☑
▾Measurement Environment	
▾BS Signal Level	
Initial CDMA Power	- 60.0 dBm
F-PICH Level	- 7.0 dB
F-FCH Level	- 7.4 dB
F-FCH Eb/Nt	0.0 dB
F-SCH0 Level	Off
F-SCH0 Eb/Nt	0.0 dB

Figure 4-31 Power Configuration – Control

All settings may not be available for all power measurement applications. The statistical settings *Repetition, Stop Condition, Statistic Count,* and *Display Mode* have the same meaning in all measurements (except the *Stop Condition* in *Receiver Quality;* see section *Receiver Quality*

Configuration – Control on p. 4.100 ff.); they are described in section *Overview Configuration – Control* on p. 4.47 ff. The *Display Mode* is available for measurement curves only.

Default Settings The *Default Settings* switches assign default values to all settings in the *Control* tab (the default values are quoted in the command description in chapter 6 of this manual). Each default switch applies to an individual application.

Remote control
`DEFault:POWer:<Application>:CONTrol  ON | OFF`

Power Step *Power Step* sets the power step size for the *Open Loop Time Response* application. The *Initial BS Power* setting is the reference level for the power step.

Remote Control
`CONFigure:POWer:OLTResponse:PSTep`
`<Power Step>`

Begin Power Step *Begin Power Step* sets the direction of the initial power step for the Open Loop Time Response measurement. The *Initial BS Power* setting is the reference level for the power step.

Remote Control
`CONFigure:POWer:OLTResponse:PSDirection`
`UP | DOWN`

Environment Enable *Environment Enable* enables or disables the environments for the individual *Power* applications:

On (box checked) The parameters listed in the *Measurement Environment* section are used as soon as a connection is established and the application is switched on.

Off (box unchecked) The *Measurement Environment* settings are ignored; the CMU always uses the corresponding *Connection Control* settings.

Note: *In the Misc. tab of the Connection Control menu, it is possible to enable or disable all measurement environments; see section Miscellaneous User Settings (Connection Control – Misc.) on p. 4.142 ff.*

The Power Control Bits for the Min. Power and Max. applications are fixed, so that the mobile transmits at its minimum or maximum output power. Disabling the environments for these applications causes the fixed Power Control Bits to be overwritten. This may change the mobile transmitter output power and cause misleading results.

Remote control
`CONFigure:POWer:<Application>:ENVironment:ENABle  ON | OFF`

Measurement Environment The *Measurement Environment* sections contain all parameters that form the measurement environments for the individual *Power* applications. The settings take effect if the environment is enabled (see above). All settings have an equivalent in the *BS Signal* or *Service Cfg.* tab of the *Connection Control* menu; see section *Signals of the CMU (Connection Control – BS Signal)* on p. 4.126 ff.

Remote Control
The commands of the *Power* measurement applications are analogous to the corresponding *BS Signal* commands. The keyord `:BSSignal` is replaced by `Power:<Application>:ENVironment`, e.g.:
`CONFigure:POWer:MIOutput[:OQPSk]:ENVironment:POWer:CDMA`
`<CDMA Power>`

BS Signal Level — Sets the levels of the forward CDMA2000 signal of the CMU. In the *Open Loop Time Response* application, the *Initial CDMA Power* sets the CDMA power prior to the initial power step of the measurement.

Impairments — Sets parameters to impair the forward CDMA2000 signal of the CMU in order to simulate realistic propagation conditions and test the MS receiver.

BS Signal Settings — Sets the *F-FCH Frame Rate* to Full, Half, Quarter, or Eighths. The frame rate has an equivalent in the *Service Cfg.* tab of the *Connection Control* menu; see section *Service Configuration of the CMU (Connection Control – Service Cfg.)* on p. 4.108 ff.

Note: *The frame rate for the* Open Loop Time Response *measurement is always* FULL. *This ensures that the measured reverse CDMA2000 signal is a continuous signal.*

Power Control — *Power Control Bits* indicates the power control bit sequence that the CMU sends to the mobile station to control its output power.

The applications of the *Power* menu command the mobile station to transmit at specific output power levels, so the *Power Control Bit* settings are always fixed. In the *Min. Power* and *Max. Power* applications, the CMU uses *All Down* and *All Up*, respectively; see note under *Measurement Enable* above. In the *Gated Output* and *Open Loop* applications, the power control bit modes *Hold* and *Auto* are used.

PCG Count — *PCG Count* defines how many power control groups are used for a single trace in the Gated Output measurement.

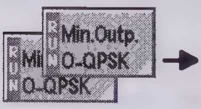
Remote Control `CONFigure:POWer:GOUTput:CONTrol:PCGcount` `<PCG Count>`

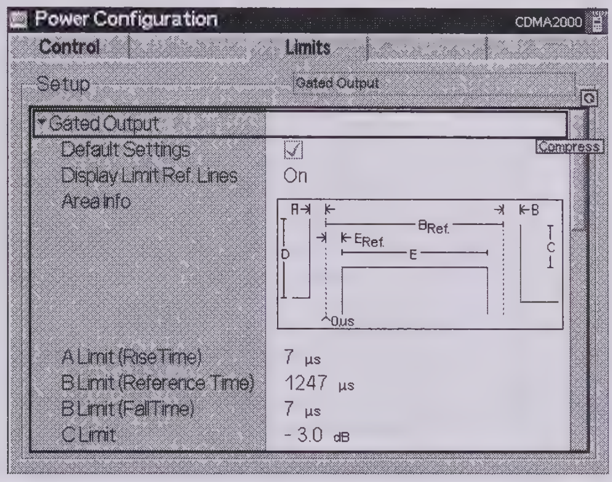
Power Configuration – Limits

The *Limits* tab defines tolerance limits for each of the Power measurement applications. This limits discussion is divided into two groups, Gated Power Limits and Minimum/Maximum Limits.

Gated Output Power Limits

The limits for the *Gated Output* application consist of a graphical tool for defining and monitoring tolerance values.





Gated Output
Default Settings ☑
Display Limit Ref. Lines On
Area info
A Limit (Rise Time) 7 µs
B Limit (Reference Time) 1247 µs
B Limit (Fall Time) 7 µs
C Limit - 3.0 dB

Figure 4-32 Power Configuration – Gated Output power limits

Default Settings The *Default Settings* switches assign default values to all settings in the *Limits* tab (the default values are quoted in the command description in chapter 6 of this manual). Each default switch applies to an individual application.

Remote control

```
DEFault:POWer:<Application>:LIMit  ON | OFF
```

Display Limit Ref. Lines *Display Limit Ref. Lines* switches the limit reference lines (green, vertical, dotted lines) in the diagram on or off.

By default, the limit reference lines show the start and end of the gated-on time interval. The left limit ref. line represents the 0-µs time reference of the x-axis. The lower and right template part can be shifted relative to the left limit ref. line. In addition the right limit ref. line and the right template part can be shifted relative to the remaining part of the template. See also *B Limit (Reference Time)* and *E Limit (Reference Time)* parameters below.

Remote Control No commands; display configuration only.

Area Info (Limit Definitions) The remaining part of the *Gated Output* section defines the limits and reference times for the GOP measurement. The meaning of the different parameters is sketched in the *Area Info* diagram showing the left, lower, and right part of the power template (red lines), the two limit reference lines (green) and the different parameters to modify the limits.

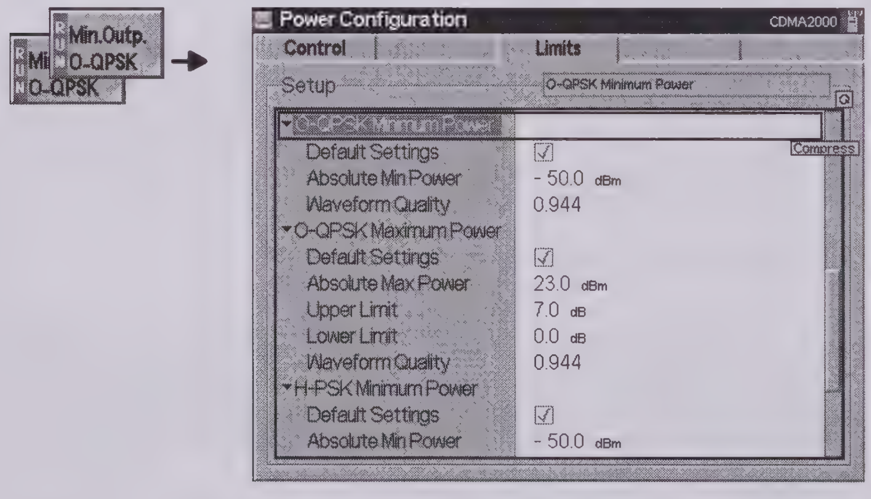
A Limit (Rise Time)	Maximum rise time
B Limit (Reference Time)	Offset time for the right limit reference line and the right part of the power template relative to the upper end of the lower part of the power template. Increasing the

	offset time effectively increases the maximum fall time. This parameter must be larger than the sum of the *E Limit (Reference Time)* and the gated-on time (see below) so that the right limit reference is larger or equal than the upper end of the lower part of the power template.
B Limit (Fall Time)	Maximum fall time
C Limit	Minimum level of the gated-on power relative to the mean output power
D Limit (relative)	Maximum level of the gated-off power relative to the mean output power
D limit (absolute)	Absolute maximum level of the gated-off power
E Limit (Reference Time)	Offset time for the lower and right part of the power template relative to the 0-µs time reference of the x-axis and the measurement curve. A positive offset time effectively increases the maximum rise time, shifting the lower part of the template to the right. The parameter can be used to modify or correct the time reference of the *Gated Output Power* diagram. Increasing this parameter also increases *B Limit (Reference Time)* so that: *B Limit (Ref. Time) ≥ E Limit (Ref. Time) + E Limit (Gated On)*
E Limit (Gated On)	Minimum gated-on time. Increasing this parameter also increases *B Limit (Reference Time)* so that: *B Limit (Ref. Time) ≥ E Limit (Ref. Time) + E Limit (Gated On)*

Remote Control

```
CONFigure:POWer:GOUTput:CAMMax:LIMit:<Area>:VALue
where <Area> = A | B | C | E
CONFigure:POWer:GOUTput:CAMMax:LIMit:D:RELative:VALue
CONFigure:POWer:GOUTput:CAMMax:LIMit:D:ABS:VALue
CONFigure:POWer:GOUTput:CAMMax:LIMit:BREFerence:VALue
CONFigure:POWer:GOUTput:CAMMax:LIMit:EREFerence:VALue
```

Minimum/Maximum Power Limits



Setup: O-QPSK Minimum Power

O-QPSK Minimum Power
- Default Settings ☑
- Absolute Min Power - 50.0 dBm
- Waveform Quality 0.944

O-QPSK Maximum Power
- Default Settings ☑
- Absolute Max Power 23.0 dBm
- Upper Limit 7.0 dB
- Lower Limit 0.0 dB
- Waveform Quality 0.944

H-PSK Minimum Power
- Default Settings ☑
- Absolute Min Power - 50.0 dBm

Figure 4-33 Power Configuration – Minimum/Maximum Power Limits

Minimum Power (O-QPSK and H-PSK)

Absolute Min Power	*Absolute Minimum Power* sets the minimum power level of the mean output power.
Waveform Quality	*Waveform Quality* sets the minimum value acceptable for the calculated waveform quality.

Remote Control

```
CONFigure:POWer:MIOutput[:OQPSk]:CAMMax:LIMit[:SCALar]:ASYM
metric[:COMBined]:VALue
CONFigure:POWer:MIOutput:HPSK:CAMMax:LIMit[:SCALar]:ASYMmet
ric[:COMBined]:VALue
<Absolute Min Power>, <Waveform Quality>
```

Maximum Output (O-QPSK and H-PSK)

Absolute Max Power	*Absolute Maximum Power* sets the maximum power level of the mean output power.
Upper Limit	*Upper Limit* sets the maximum level of the mean output power relative to the MS nominal maximum output power.
Lower Limit	*Lower Limit* sets the minimum level of the mean output power relative to the MS nominal maximum output power.
Waveform Quality	*Waveform Quality* sets the minimum value acceptable for the calculated waveform quality.

Remote Control

```
CONFigure:POWer:MAOutput[:OQPSk]:CAMMax:LIMit
[:SCALar]:ASYMmetric[:COMBined]:VALue
CONFigure:POWer:MAOutput:HPSK:CAMMax:LIMit
[:SCALar]:ASYMmetric[:COMBined]:VALue
<Absolute Max Power>, <Upper Limit>, <Lower Limit>,
<Waveform Quality>
```

Modulation Measurements

The menu group *Modulation* contains several applications to measure the modulation parameters such as frequency error, waveform quality of the mobile station, and matching of the respective tolerance limits. Measurement results are displayed with a graph and a table of measurement results. The popup menu *Modulation Configuration* configures the parameters of the modulation measurements.

The *Modulation* menu is opened from the *Menu Select* menu or from any other measurement menu in *CDMA2000 Signalling* using the hotkey *Menu – Modulation* (see *Figure 4-35*). The initial screen returns to the modulation application last accessed.

In the softkey bar on the right side, the *Modulation* menu provides different types of softkeys:

- The measurement control softkey *Overview O-QPSK* changes to *EVM O-QPSK* etc., depending on the application selected. This softkey controls the measurement, indicates its status *(RUN | HLT | OFF)* and opens the configuration menu *Modulation Configuration*. The hotkeys associated to the measurement control softkey define the scope of the *Modulation* measurement.
- The other softkeys on the right side are combined with various hotkeys (e.g. the hotkeys *RF Max. Level* and *RF Mode* belong to the softkey *Analyzer Level).* The softkey/hotkey combinations provide test settings and switch over between different measurements.

Note: *The CMU supports both O-QPSK and H-PSK modulation schemes. The CMU automatically selects the correct modulation scheme unless this feature is disabled in the Misc. tab of the Connection Control menu. Refer to section Miscellaneous User Settings (Connection Control – Misc.) on p.* 4.142 *ff.*

O-QPSK measurements require a reverse radio configuration setting of 1 or 2. H-PSK measurements require a reverse radio configuration setting of 2 or 3. Refer to Table 4-4 *on page* 4.34 *for a list of measurements and their radio configuration requirements.*

Note: *The configuration settings made in the* Modulation *applications (with either the softkeys or the* Configuration *menus) apply only to the measurements presented here. For example, configuration settings made here do not affect the configuration settings made within the* Overview *or* Power *applications.*

The O-QPSK and H-PSK applications of the Modulation *measurement have their own environments (see Chapter 3, section* Measurement Environments*). If the measurement environment is enabled in the configuration menu (see description in section Overview Configuration – Control on p. 4.47 ff.), it overrides the Connection Control parameters as long as the measurement is switched on (RUN) and a connection is established. All* Modulation *measurement results are always obtained with the same parameter set.*

Refer to Table 4-4 *on page* 4.34 *for a list of measurements and their radio configuration requirements.*

The CMU measures the O-QPSK / H-PSK modulation accuracy by calculating the Phase Error, Magnitude Error, and Error Vector Magnitude of the modulated signal from the mobile station. *Figure 4-34* shows a representation of these signal errors compared to an ideal signal.

Phase Error (PE) is the measured phase difference of the I/Q components of the signal received (from the mobile station) and an ideal reference signal at the detection points.

Magnitude Error (ME) is the normalized magnitude (amplitude) difference of the I/Q components of the signal received from the mobile station and an ideal reference signal at the detection points.

Error Vector Magnitude (EVM) is the normalized magnitude of the calculated vector linking the measured I/Q values to the ideal signal's I/Q components at the detection points.

The In-phase and Quadrature reference components are based on an O-QPSK / H-PSK waveform as specified in the IS-2000 standards publication.

For a CDMA2000 signal (H-PSK in RC3, 4) the composite Phase Error (PE), Magnitude Error (ME), Error Vector Magnitude (EVM), and Waveform Quality are calculated.

The measurement interval for O-QPSK / H-PSK is 616 chip intervals (≅ 0.5 ms). The graphical displays represents 500 chips for O-QPSK and 616 chips for H-PSK..

Note: *The screen shots and discussions in this chapter refer to O-QPSK but apply to both modulation schemes.*

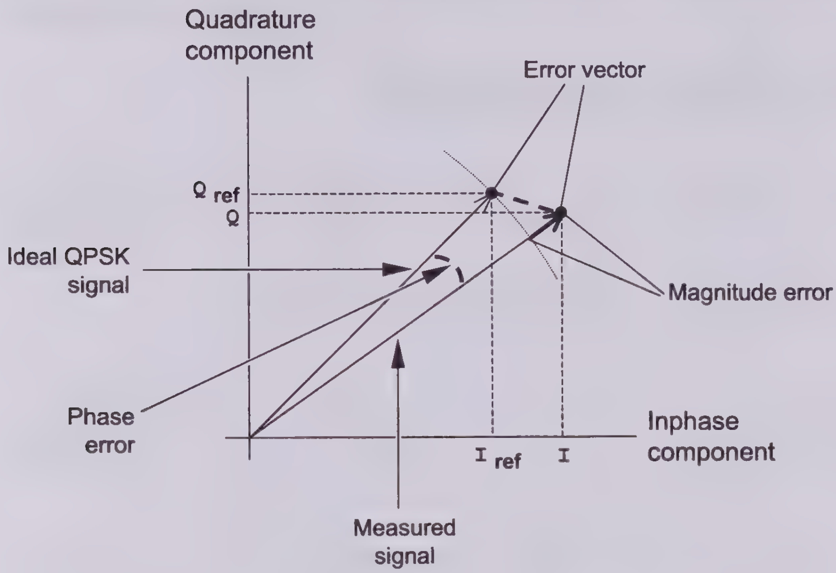
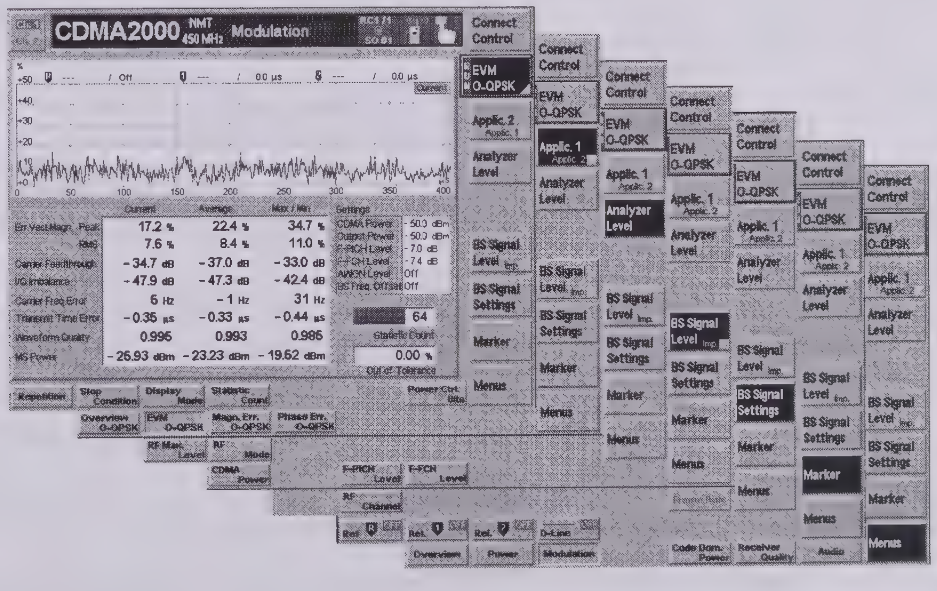


Figure 4-34 Modulation errors

Menu Select



	Current	Average	Max / Min
Err.Vect.Magn. Peak	17.2 %	22.4 %	34.7 %
RMS	7.6 %	8.4 %	11.0 %
Carrier Feedthrough	- 34.7 dB	- 37.0 dB	- 33.0 dB
I/Q Imbalance	- 47.9 dB	- 47.3 dB	- 42.4 dB
Carrier Freq.Error	6 Hz	- 1 Hz	31 Hz
Transmit Time Error	- 0.35 µs	- 0.33 µs	- 0.44 µs
Waveform Quality	0.996	0.993	0.986
MS Power	- 26.93 dBm	- 23.23 dBm	- 19.62 dBm

Settings	
CDMA Power	- 50.0 dBm
Output Power	- 50.0 dBm
F-PICH Level	- 7.0 dB
F-FCH Level	- 7.4 dB
AWGN Level	Off
BS Freq. Offset	Off

Statistic Count: 64

Out of Tolerance: 0.00 %

Figure 4-35 Modulation measurement menu

Softkey Selections

Each *Moodulation* application is controlled by means of the measurement control softkey below the *Connect. Control* softkey and the associated hotkeys. The properties of the measurement control softkey are analogous in all measurements; see section *Analyzer/Generator – Measurement Control* in the *Non Signalling* section. The remaining softkeys select the application and provide application-specific settings.

Appli-cation

The *Application* softkey activates a set of hotkeys to select a modulation application. This softkey toggles the application hotkeys between the O-QPSK and H-PSK modulation schemes (*Applic. 1* and *Applic. 2*). When an application is selected, the corresponding measurement screen is displayed.

Only O-QPSK keys and menus are shown and described but the information also applies to H-PSK.

Note: *The* O-QPSK *modulation measurements require a reverse Radio Configuration 1 or 2, H-PSK measurements a reverse Radio Configuration 3 or 4; see Table 4-4 on p.* 4.34.

Overview O-QPSK

The *Overview O-QPSK* hotkey displays the statistics for all modulation measurements. No graphical display is provided.

Remote Control

The *Overview O-QPSK* and *Overview H-PSK* applications are selected by the keywords `OVERview[:OQPSk]` and `OVERview:HPSK` in the 3rd and 4th level of the `POWer` commands, e.g.

```
CONFigure:MODulation:OVERview[:OQPSk]...
CONFigure:MODulation:OVERview:HPSK...
```

EVM O-QPSK

The *Error Vector Magnitude* hotkey displays the Error Vector Magnitude. The Error Vector Magnitude measurement is described in section *Measurement Results* on p. 4.71 ff.

Remote Control

The *EVM O-QPSK* and *EVM H-PSK* applications are selected by the keywords `EVMagnitude[:OQPSk]` and `EVMagnitude:HPSK` in the 3rd and 4th level of the `POWer` commands, e.g.

```
CONFigure:MODulation:EVMagnitude[:OQPSk]...
CONFigure:MODulation:EVMagnitude:HPSK...
```

Magn. Err. O-QPSK

The *Magnitude Error* hotkey displays the Magnitude Error measurement. The Magnitude Error measurement is described in section *Measurement Results* on p. 4.71 ff.

Remote Control

The *Magn. Err. O-QPSK* and *Magn. Err. H-PSK* applications are selected by the keywords `MERRor[:OQPSk]` and `MERRor:HPSK` in the 3rd and 4th level of the `POWer` commands, e.g.

```
CONFigure:MODulation:MERRor[:OQPSk]...
CONFig
```

Phase Err. O-QPSK

The *Phase Error* hotkey displays the Phase Error measurement. The Phase Error measurement is described in section *Measurement Results* on p. 4.71 ff.

Remote Control

The *Phase Err. O-QPSK* and *Phase Err. H-PSK* applications are selected by the keywords `PERRor[:OQPSk]` and `PERRor:HPSK` in the 3rd and 4th level of the `POWer` commands, e.g.

```
CONFigure:MODulation:PERRor[:OQPSk]...
CONFigure:MODulation:PERRor:HPSK...
```

Analyzer Level Trg.

The *Analyzer Level/Trigger* softkey toggles between two sets of hotkeys to control the level in the RF signal path and define the trigger settings. These general settings are provided in the *Analyzer* and *Trigger* tabs of the *Connection Control* menu; see section *Analyzer Control (Connection Control – Analyzer)* on p. 4.141 ff and *Trigger (Connection Control – Trigger)* on p. 4.139 ff.

BS Signal Level Imp.

The *BS Signal Level / Imp.* softkey toggles between two sets of hotkeys to adjust the signal impairments and the base station signal levels.

All settings belong to the *Modulation* measurement environment. They are also provided in the *Modulation Configuration* menu and described in section *Power Configuration – Control* on p. 4.62 ff.

BS Signal Set. P. Ctrl

The *BS Signal Set. /P. Ctrl* softkey displays a set of hotkeys to adjust the RF channel and frame rate and the power control bits that the CMU sends to the mobile station to control its output power. *Frame Rate* and *Power Control Bits* belong to the *Overview* measurement environment and are also provided in the *Overview Configuration* menu (refer to section *Power Configuration – Control* on p. 4.62 ff.). *RF Channel* is a general parameter; see p. 4.126.

Marker Display

The *Marker/Display* softkey positions up to three markers and a baseline (D-Line) in the test diagram and outputs their values. Refer to page 4.145 for detailed information about markers.

The softkey is only available for applications providing a graphical diagram, i.e. for the *EVM..., Magn. Err...* and *Phase Err...* applications.

Menus

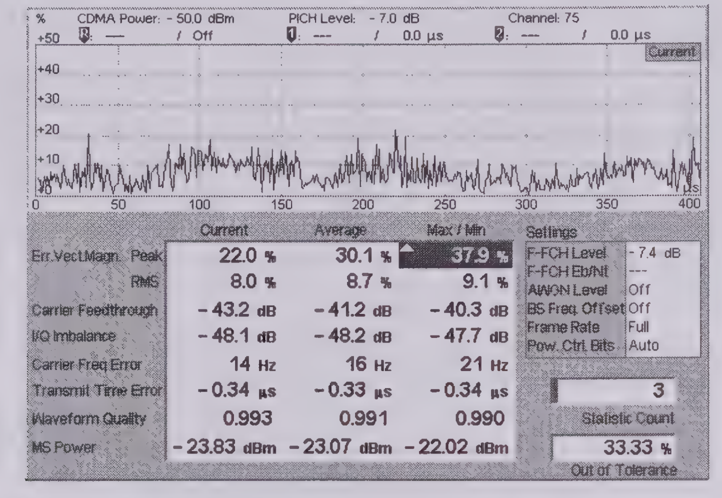
The *Menus* softkey displays the hotkey bar for switching to the other measurement menus.

Measurement Results

The modulation measurement screens are similar for each modulation application (The *Overview...* applications do not provide a graph). The description of the graphs and common output data immediately follows. Information specific to an application is located within the application heading. Limits for all modulation measurements are defined in the *Modulation Control* configuration menu.

The measurement screens can be divided into three groups:

- Scalar measurement results (parameter lines and output tables)
- Graph (a trace plotted as a function of time)
- Settings overview



Parameter lines 1 and 2

Measurement graph

Output table

CDMA Power: - 50.0 dBm PICH Level: - 7.0 dB Channel: 75

R: — / Off 1: --- / 0.0 µs 2: --- / 0.0 µs

Current

	Current	Average	Max / Min
Err.Vect.Magn. Peak	22.0 %	30.1 %	37.9 %
RMS	8.0 %	8.7 %	9.1 %
Carrier Feedthrough	- 43.2 dB	- 41.2 dB	- 40.3 dB
I/Q Imbalance	- 48.1 dB	- 48.2 dB	- 47.7 dB
Carrier Freq Error	14 Hz	16 Hz	21 Hz
Transmit Time Error	- 0.34 µs	- 0.33 µs	- 0.34 µs
Waveform Quality	0.993	0.991	0.990
MS Power	- 23.83 dBm	- 23.07 dBm	- 22.02 dBm

Settings	
F-FCH Level	- 7.4 dB
F-FCH Eb/Nt	---
AWGN Level	Off
BS Freq. Offset	Off
Frame Rate	Full
Pow. Ctrl. Bits	Auto

3
Statistic Count

33.33 %
Out of Tolerance

Figure 4-36 Modulation results display

Parameter Lines Scalar measurement results and settings are indicated in the two parameter lines above the test diagram and in the *Settings* table below.

1st Line The first parameter line contains the following settings:

Output Power	Total output power of the CMU, calculated as the sum of the forward CDMA power and the AWGN Level; see
PICH Level	PICH level as set by means of the *BS Signal Level* softkey
Channel	*RF Channel* set for the BS Signal

2nd Line The second parameter line contains the following marker values:

R	Level and time of reference marker
1	Level and time of marker 1 (setting *absolute*) and/or difference from reference marker (setting *relative*)
2	Level and time of marker 2 (setting *absolute*) and/or difference from reference marker (setting *relative*)

Settings The values shown in the *Settings* table are defined in the *Control* tab of the *Connection Control* menu; see section *Modulation Configuration – Control* on p. 4.74 ff.

Measurement Graph The *Measurement Graph* is displayed as a continuous curve together with the limit lines and all active markers.

The graph in each measurement shows the respective measurement error as a function of time. The display mode for the graph *(Current, Average, Max/Min)* is indicated in the upper right corner of the screen.

Statistic Count The *Statistic Count* is the number of intervals since the start of the measurement. The bar graph represents a percentage of intervals measured based on the number of intervals *(Statistic Count)* set in the configuration menu.

Output Table

The output table contains a tabular overview of modulation related measurements. The first rows of data are specific to the selected modulation measurement. The remaining rows are identical for each modulation measurement.

Three values are given for each row:

Current	These are the current values of the measurement interval.
Max/Min	These are the extreme values (and their polarity) of all measurement intervals since the measurement started.
Average	These are the average values of a number of measurement intervals (defined by the *Statistic Count* setting; see section *General Settings* in Chapter 3).

Any values exceeding the defined limits appear with a red background. Limit values are set in the Limit tab of the *Modulation Configuration* menu.

Modulation Error

Refer to the respective measurement type for information about the data reported in these first two rows.

Phase Error	Measured phase difference of the I/Q components of the signal received (from the mobile station) and an ideal reference signal at the detection points.
Magnitude Error	Difference in magnitude (in percent) between the received signal waveform and an ideal O-QPSK signal waveform. The magnitude error is the difference in amplitude between the measured signal from the mobile station transmitter and an ideal signal waveform at the detection points.
Error Vector Magnitude	Calculated percentage of vector error (at the detection points) between the received signal and an ideal signal.

Carrier Feedthrough

Carrier Feedthrough refers to the origin offset, which is the magnitude of the RF carrier relative to the magnitude of the modulated carrier.

I/Q Imbalance

I/Q Imbalance is the amplitude ratio between the in-phase (I) and quadrature (Q) components of the signal.

Carrier Freq Error

Carrier Frequency Error is the difference between the nominal frequency of the selected channel and the measured frequency.

Transmit Time Error

Transmission Time Error is the time offset between the mobile station's signal and the CMU's signal.

Waveform Quality

Waveform Quality is the modulation accuracy of the transmitted signal. The waveform quality is obtained by comparing the transmitted signal to an ideal O-QPSK signal as defined in standard TIA/EIA-98.

MS Power

MS Power is the total transmitted power level from the mobile station.

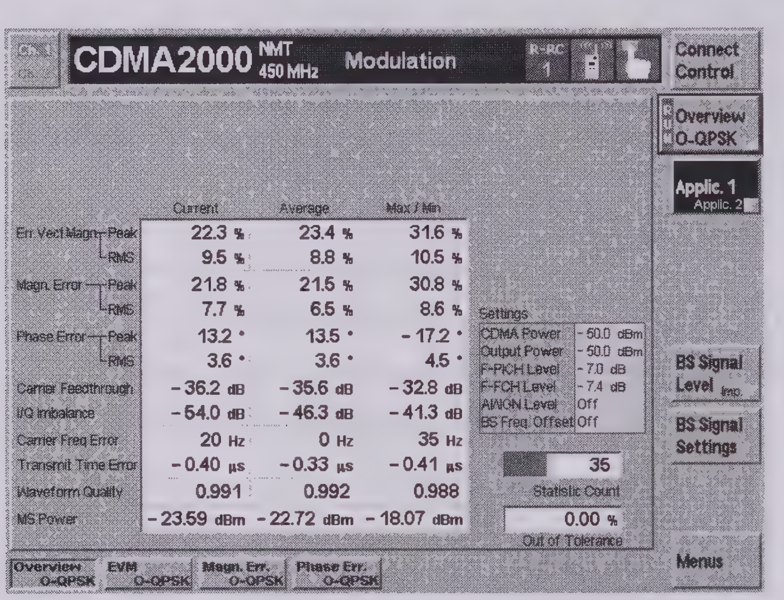
Remote Control

```
READ[:SCALar]:MODulation:<Application>?
FETCh[:SCALar]:MODulation:<Application>?
SAMPle[:SCALar]:MODulation:<Application>?
```

Overview

The Overview application allows you to view all modulation measurements in a single output table (no graph of the measurements is provided).

The peak and the RMS values of the current measurement interval are displayed for each modulation application. The average values (positive or negative) are calculated over a user definable number of *Statistic Counts*. The Min/Max. values are the extreme values from the start of the measurement.



		Current	Average	Max / Min
Err. Vect Magn.	Peak	22.3 %	23.4 %	31.6 %
	RMS	9.5 %	8.8 %	10.5 %
Magn. Error	Peak	21.8 %	21.5 %	30.8 %
	RMS	7.7 %	6.5 %	8.6 %
Phase Error	Peak	13.2 °	13.5 °	- 17.2 °
	RMS	3.6 °	3.6 °	4.5 °
Carrier Feedthrough		- 36.2 dB	- 35.6 dB	- 32.8 dB
I/Q imbalance		- 54.0 dB	- 46.3 dB	- 41.3 dB
Carrier Freq Error		20 Hz	0 Hz	35 Hz
Transmit Time Error		- 0.40 µs	- 0.33 µs	- 0.41 µs
Waveform Quality		0.991	0.992	0.988
MS Power		- 23.59 dBm	- 22.72 dBm	- 18.07 dBm

Settings

CDMA Power	- 50.0 dBm
Output Power	- 50.0 dBm
F-PICH Level	- 7.0 dB
F-FCH Level	- 7.4 dB
AWGN Level	Off
BS Freq. Offset	Off

Statistic Count: 35

Out of Tolerance: 0.00 %

Measurement softkey

Figure 4-37 Overview display

Modulation Configuration

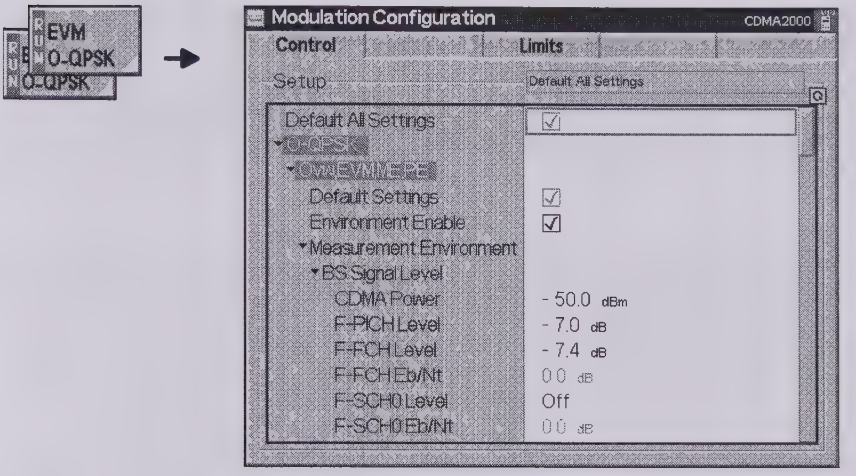
The popup menu *Modulation Configuration* contains three tabs to define the parameters of the modulation measurements including the error tolerances.

Pressing the measurement softkey twice opens the popup menu *Modulation Configuration*. Press the associated hotkeys to change between tabs. Use the roll-key to expand or compress the list of settings displayed.

Modulation Configuration – Control

The *Control* tab controls the modulation measurement applications. The control configuration is first divided into settings for O-QPSK and H-PSK. Within these categories, there are both configurations that affect all modulation measurements and settings for each individual modulation measurement.

Since the settings for O-QPSK and H-PSK are identical, only the O-QPSK menus are shown and described.



Setup	Default All Settings
Default All Settings	☑
O-QPSK	
Ovw/EVM/ME/PE	
Default Settings	☑
Environment Enable	☑
Measurement Environment	
BS Signal Level	
CDMA Power	- 50.0 dBm
F-PICH Level	- 7.0 dB
F-FCH Level	- 7.4 dB
F-FCH Eb/Nt	0.0 dB
F-SCH0 Level	Off
F-SCH0 Eb/Nt	0.0 dB

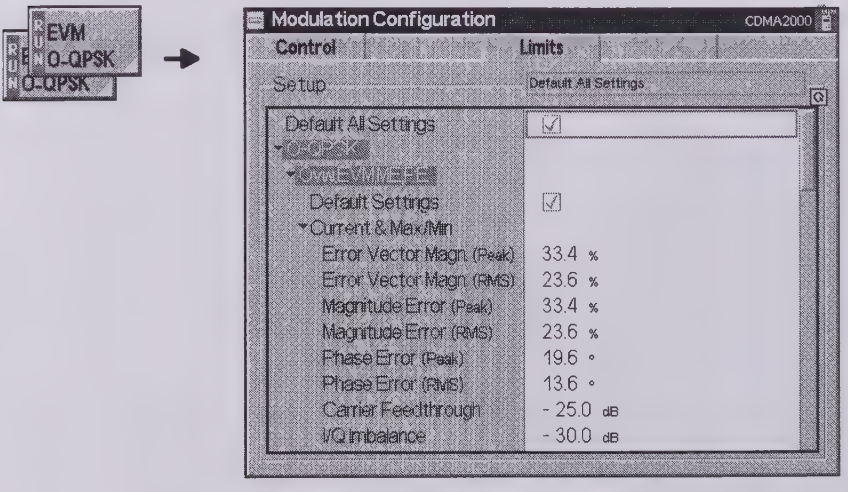
Figure 4-38 Modulation Configuration – Control

All settings may not be available for all modulation measurement applications. The statistical settings *Repetition* , *Stop Condition, Statistic Count,* and *Display Mode* have the same meaning in all measurements (except the *Stop Condition* in *Receiver Quality;* see section *Receiver Quality Configuration – Control* on p. 4.100 ff.); they are described in section *Overview Configuration – Control* on p. 4.47 ff. The *Display Mode* is available for measurement curves only.

All other parameters are analogous to the corresponding *Power* settings and described in section *Power Configuration – Control* on p. 4.62 ff.

Modulation Configuration – Limits

The *Limits* tab defines the tolerance limits for each of the *Modulation* measurement applications. Two sets of limits are configurable for each measurement: the *Current* and *Maximum/Minimum* measurement limits and the *Average* measurement limits.



Setup	Default All Settings
Default All Settings	☑
O-QPSK	
Ovw/EVM/ME/PE	
Default Settings	☑
Current & Max/Min	
Error Vector Magn. (Peak)	33.4 %
Error Vector Magn. (RMS)	23.6 %
Magnitude Error (Peak)	33.4 %
Magnitude Error (RMS)	23.6 %
Phase Error (Peak)	19.6 °
Phase Error (RMS)	13.6 °
Carrier Feedthrough	- 25.0 dB
I/Q Imbalance	- 30.0 dB

Figure 4-39 Modulation Configuration – Limits

Default All Settings	The *Default All Settings* switch assigns default values to all parameters of the modulation *Limits* tab (the default values are quoted in the command description in chapter 6 of this manual). Additional default switches are provided for the individual applications.

Remote control

```
DEFault:MODulation:<Application>:LIMit  ON | OFF
```

Current & Max/Min

Current and Max/Min sets the limits for the measured values in the current waveform interval or of the extreme values of all measured waveform intervals (Min/Max).

Remote control

```
CONFigure:MODulation:OEMP[:OQPSk]:CMMax:LIMit[:SCALar]:
SYMMetric[:COMBined]:VALue
CONFigure:MODulation:OEMP[:OQPSk]:CMMax:LIMit[:SCALar]:
SYMMetric[:COMBined]:ENABle
CONFigure:MODulation:OEMP[:OQPSk]:CMMax:LIMit[:SCALar]:
SYMMetric[:COMBined]
CONFigure:MODulation:OEMP:HPSK:CMMax:LIMit[:SCALar]:
SYMMetric[:COMBined]:VALue
CONFigure:MODulation:OEMP:HPSK:CMMax:LIMit[:SCALar]:
SYMMetric[:COMBined]:ENABle
CONFigure:MODulation:OEMP:HPSK:CMMax:LIMit[:SCALar]:
SYMMetric[:COMBined]
```

Average

Average sets the limits are for the average value of the measured values derived from the last statistic cycle.

Remote control

```
CONFigure:MODulation:OEMP[:OQPSk]:AVERage:LIMit[:SCALar]:
SYMMetric[:COMBined]:VALue
CONFigure:MODulation:OEMP[:OQPSk]:AVERage:LIMit[:SCALar]:
SYMMetric[:COMBined]:ENABle
CONFigure:MODulation:OEMP[:OQPSk]:AVERage:LIMit[:SCALar]:
SYMMetric[:COMBined]
CONFigure:MODulation:OEMP:HPSK:AVERage:LIMit[:SCALar]:
SYMMetric[:COMBined]:VALue
CONFigure:MODulation:OEMP:HPSK:AVERage:LIMit[:SCALar]:
SYMMetric[:COMBined]:ENABle
CONFigure:MODulation:OEMP:HPSK:AVERage:LIMit[:SCALar]:
SYMMetric[:COMBined]
```

Spectrum Measurements

The *Spectrum* menu provides access to the ACP spectrum measurement. The *Spectrum* menu is opened from the *Menu Select* menu (with associated key at the front of the instrument). The hotkeys associated to the *Menus* softkey switch over between the *Spectrum* menu and the remaining measurement menus of the CDMA2000 function group.

The *Spectrum* measurement serves to measure the strength of spurious emissions in the vicinity of the designated channel frequency (carrier frequency). An excess amount of off-carrier power increases the interference with adjacent channels and decreases the system capacity.

ACP	The off-carrier power is measured at four configurable, symmetrical pairs of offset frequencies from the nominal carrier frequency and displayed as an Adjacent Channel Power (ACP) relative to the carrier power. In contrast to other power measurements, the ACP is measured with a 30 kHz spectrum analyzer filter; see also Table 4-5 on p. 4.54.

The ACP at a single pair of offset frequencies is also available in the *Overview* menu; see *Sideband Suppression* on p. 4.46.

In the softkey bar on the right side, the *Spectrum* menu provides different types of softkeys:

- The measurement control softkey *ACP* controls the measurement, indicates its status *(RUN | HLT | OFF)* and opens the configuration menu *Spectrum Configuration*. The hotkeys associated to the measurement control softkey define the scope of the *Spectrum* measurement.
- The other softkeys on the right side are combined with various hotkeys (e.g. the hotkeys *RF Max. Level* and *RF Mode* belong to the softkey *Analyzer Level)*. The softkey/hotkey combinations provide test settings and switch over between different measurements.

Note: *In contrast to most other measurement applications,* Spectrum – ACP *does not have its own environment (see Chapter 3, section* Measurement Environments). *All settings are either common settings or measurement-specific settings that are also provided in the* Spectrum Configuration *menu.*

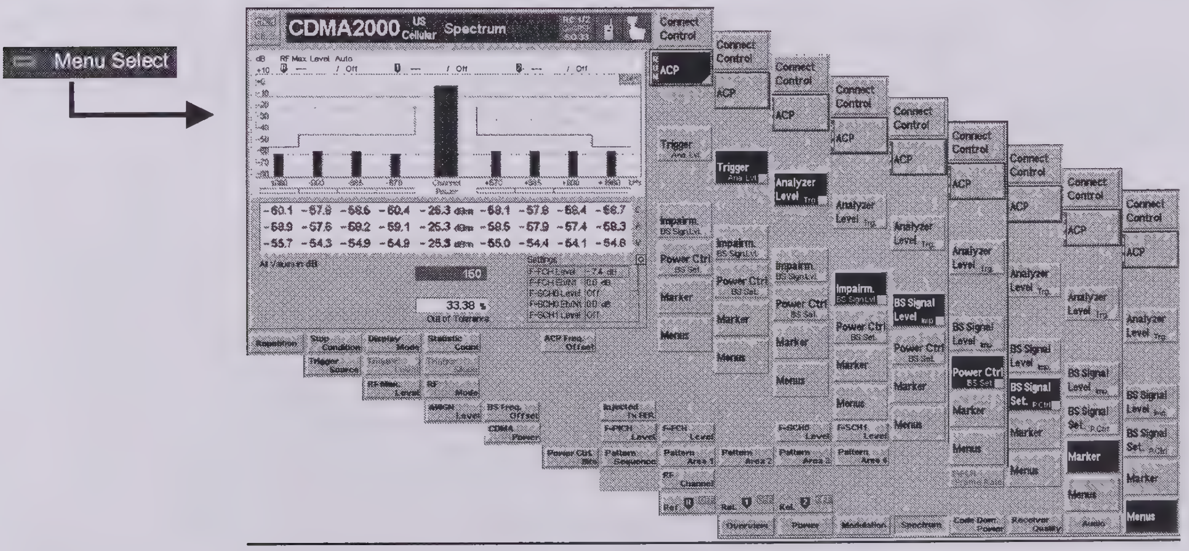


Figure 4-40 Measurement menu Spectrum

Softkey Selections

The *Spectrum* application is controlled by means of the measurement control softkey below the *Connect. Control* softkey and the associated hotkeys. The properties of the measurement control softkey are analogous in all measurements; see section *Analyzer/Generator – Measurement Control* in the *Non Signalling* section. The remaining softkeys and provide common settings.

Analyzer Level Trg.

The *Analyzer Level/Trigger* softkey toggles between two sets of hotkeys to control the level in the RF signal path and define the trigger settings.

These general settings are provided in the *Analyzer* and *Trigger* tabs of the *Connection Control* menu; see section *Analyzer Control (Connection Control – Analyzer)* on p. 4.141 ff and *Trigger (Connection Control – Trigger)* on p. 4.139 ff.

BS Signal Level Imp.

The *BS Signal Level / Imp.* softkey toggles between two sets of hotkeys to adjust the signal impairments and the base station signal levels.

These general settings are provided in the *BS Signal* tab of the *Connection Control* menu and described in section *Signals of the CMU (Connection Control – BS Signal)* on p. 4.126 ff.

BS Signal Set. P. Ctrl

The *BS Signal Set. /P. Ctrl* softkey toggles between two sets of hotkeys to adjust the RF channel and frame rate and configure the power control bits that the CMU sends to the mobile station to control its output power.

These general settings are provided in the *Generator* tab of the *Connection Control* menu and described in section *Signals of the CMU (Connection Control – BS Signal)* on p. 4.126 ff.

Marker Display

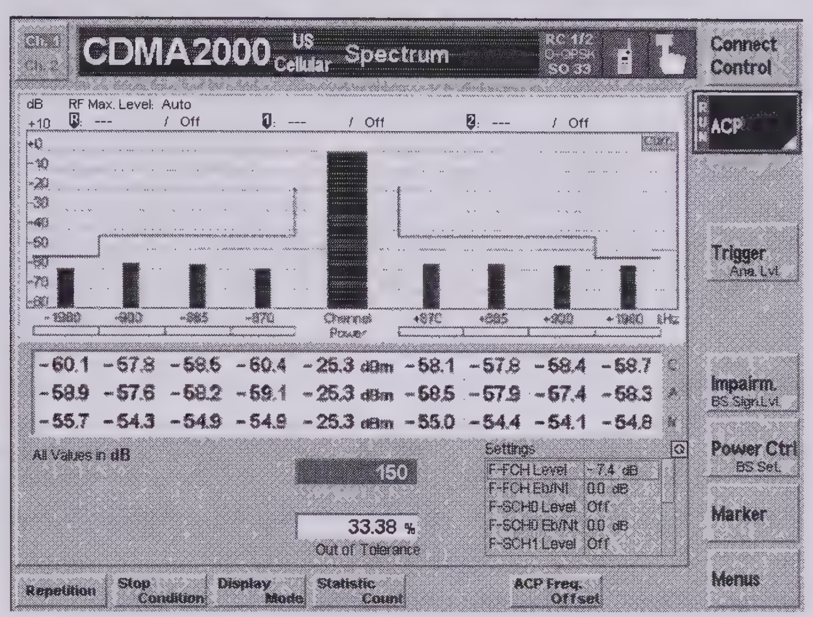
The *Marker* softkey positions up to three markers in the test diagram and inidicates their values. Refer to page 4.145 for detailed information about markers.

Menus

The *Menus* softkey displays the hotkey bar for switching to the other measurement menus.

Measurement Results

The results are displayed in a bar graph and an output table plus various output fields below.



Parameter lines 1 and 2

Bargraph

Output table

Additional fields and settings table

RF Max. Level: Auto

R: --- / Off 1: --- / Off 2: --- / Off

-1980	-900	-885	-870	Channel Power	+870	+885	+900	+1980 kHz	
-60.1	-57.8	-58.6	-60.4	-25.3 dBm	-58.1	-57.8	-58.4	-58.7	C
-58.9	-57.6	-58.2	-59.1	-25.3 dBm	-58.5	-57.9	-57.4	-58.3	A
-55.7	-54.3	-54.9	-54.9	-25.3 dBm	-55.0	-54.4	-54.1	-54.8	M

All Values in dB

150

33.38 %
Out of Tolerance

Settings

F-FCH Level	-7.4 dB
F-FCH Eb/Nt	0.0 dB
F-SCH0 Level	Off
F-SCH0 Eb/Nt	0.0 dB
F-SCH1 Level	Off

Figure 4-41 Display of results (Analyzer/Generator)

Parameter Lines Scalar measurement results and settings are indicated in the two parameter lines above the test diagram and in the *Settings* table below.

1st Line The first parameter line contains the following settings:

RF Max. Level The total output power, either calculated in adaptation to the signal level (Auto) or set manually.

2nd Line The second parameter line contains the following marker values:

R	Level and time of reference marker
1	Level and time of marker 1 (setting *absolute*) and/or difference from reference marker (setting *relative*)
2	Level and time of marker 2 (setting *absolute*) and/or difference from reference marker (setting *relative*)

Bar Graph The bar graph represents the Adjacent Channel Power (ACP) for the given *ACP Frequency Offset* values. The ACP is the ratio of the power at the frequency offset to the channel power. The y-axis of the diagram uses a fixed dB-scale.

The channel power is displayed in the center of the diagram. The offset values can be selected in the *Spectrum Configuration – Control* tab described on p. *4.80.* All powers are measured with a 30 kHz spectrum analyzer filter and averaged over a basic evaluation period of one waveform interval.

The red lines in the diagram indicate the upper limits for the ACP as set in the *Spectrum Configuration – Limits* tab (see p. 4.81).

The display mode for the graph *(Current, Average, Max/Min)* is indicated in the upper right corner of the screen. It can be selected with the softkey *Display Mode* that is visible when the measurement control softkey has been selected.

Output Table

The output table displays the values in the bar graph for the three possible display modes. Each display mode corresponds to a separate line:

Current (C.)	Average ACP and channel power (central dBm-value) the measurement interval.
Average (A.)	Average of the *Current* results referenced to the last statistics cycle; see description of averaging in Chapter 3, section *General Settings*.
Maximum (M.)	Maximum of all *Current* results since the measurement was started.

Remote Control

`READ[:SCALar]:SPECtrum:ACP?`
`FETCh[:SCALar]:SPECtrum:ACP?`
`SAMPle[:SCALar]:SPECtrum:ACP?`

Additional output fields

Below the output table, the following results are displayed:

Statistic Count	Number of waveform intervals per statistics cycle. The colored bar indicates the relative measurement progress in the statistics cycle.
Out of Tolerance	Percentage of waveform intervals measured where the tolerances are exceeded.

Limit Check

A red output field indicates that the measurement result exceeds the upper relative limits set in the *Spectrum Configuration – Limits* tab (see p. 4.81). If a limit is exceeded in the diagram, the blue bar crosses the red limit line, and the corresponding section of the horizontal limit bar below the diagram turns red.

Remote control
`CALCulate[:SCALar]:SPECtrum:ACP:MATChing:LIMits?`

Settings table

The *Settings* table on the lower right side of the *Spectrum* menu gives an overview of the measurement settings of the current application as defined by means of the softkey/hotkey combinations or in the configuration menus. The roll-key scrolls and expands the *Setup* table.

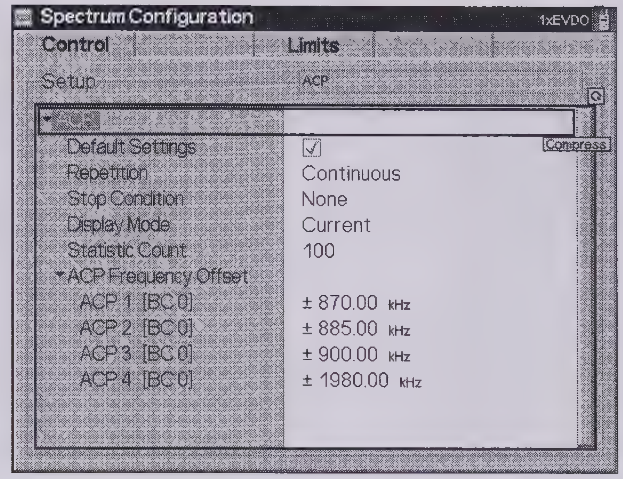
Spectrum Configuration

The popup menu *Spectrum Configuration* contains two tabs to define the parameters of the spectrum measurements including the error tolerances.

Pressing the measurement softkey twice opens the popup menu *Spectrum Configuration*. Press the associated hotkeys to change between tabs. Use the roll-key to expand or compress the list of settings displayed.

Spectrum Configuration – Control

The *Control* tab controls the spectrum measurement applications by defining the statistical settings and the four offset frequencies for the ACP measurement.



Setup ACP

Default Settings ☑
Repetition Continuous
Stop Condition None
Display Mode Current
Statistic Count 100
ACP Frequency Offset
ACP 1 [BC 0] ± 870.00 kHz
ACP 2 [BC 0] ± 885.00 kHz
ACP 3 [BC 0] ± 900.00 kHz
ACP 4 [BC 0] ± 1980.00 kHz

Figure 4-42 Spectrum Configuration – Control

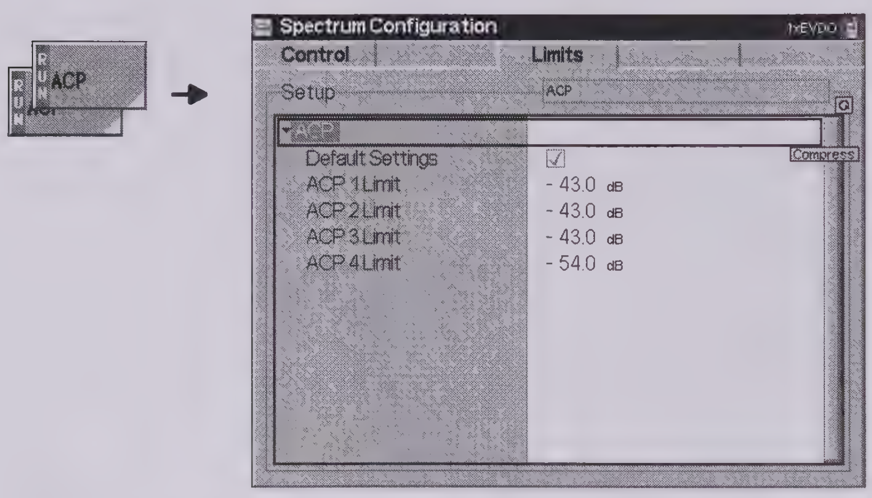
The statistical settings *Repetition* , *Stop Condition, Statistic Count,* and *Display Mode* have the same meaning in all measurements (except the *Stop Condition* in *Receiver Quality;* see section *Receiver Quality Configuration – Control* on p. 4.100 ff.); they are described in section *Overview Configuration – Control* on p. 4.47 ff.

ACP Frequency Offset	*ACP Frequency Offset* selects the frequency offset from the selected Channel/Frequency where the ACP is measured. The selected offset values will be displayed in the diagram under the measurement bars.
ACP1…4	*ACP 1..4* are pairs of symmetrical offsets: The ACP is measured at the carrier frequency plus and minus the selected frequency offset. The measurement supports up to 4 different offset pairs; setting *OFF* for a pair disables the ACP measurement. The default values for the frequency offsets depend on the selected band class (BC 0 to BC 10; see Table 1-1 in Chapter 1).

Remote Control	`CONFigure:SPECtrum:ACP:CONTrol:FOFFset:ACP1[?]`
	`CONFigure:SPECtrum:ACP:CONTrol:FOFFset:ACP2[?]`
	`CONFigure:SPECtrum:ACP:CONTrol:FOFFset:ACP3[?]`
	`CONFigure:SPECtrum:ACP:CONTrol:FOFFset:ACP4[?]`

Spectrum Configuration – Limits

The *Limits* tab defines the tolerance limits for each of the *Spectrum* measurement application.



ACP

Default Settings ☑

ACP 1 Limit - 43.0 dB

ACP 2 Limit - 43.0 dB

ACP 3 Limit - 43.0 dB

ACP 4 Limit - 54.0 dB

Figure 4-43 Modulation Configuration – Limits

ACP 1..4 Limit *ACP 1..4 Limit* sets the limit for each pair of symmetrical ACP frequency offsets. The limits are used for the measurement at the positive and the negative offset.

Remote control

```
CONFigure:SPECtrum:ACP:LIMit:ACP1[?]
CONFigure:SPECtrum:ACP:LIMit:ACP2[?]
CONFigure:SPECtrum:ACP:LIMit:ACP3[?]
CONFigure:SPECtrum:ACP:LIMit:ACP4[?]
```

Code Domain Power Measurements

The menu group *Code Domain Power* (CDP H-PSK) contains the functions to measure the Code Domain Power (CDP), Peak Code Domain Error Power (PCDEP), and Channel Power.

The *Modulation* menu is opened from the *Menu Select* menu or from any other measurement menu in *CDMA2000 Signalling* using the hotkey *Menu – Modulation* (see *Figure 4-44*). The initial screen returns to the modulation application last accessed.

In the softkey bar on the right side, the *Code Domain Power* menu provides different types of softkeys:

- The measurement control softkey *CDP H-PSK* changes to *PCDEP H-PSK* and *Ch. Power H-PSK,* depending on the application selected. This softkey controls the measurement, indicates its status *(RUN | HLT | OFF)* and opens the configuration menu *Code Dom. Power Configuration*. The hotkeys associated to the measurement control softkey define the scope of the *Code Domain Power* measurement.
- The other softkeys on the right side are combined with various hotkeys (e.g. the hotkeys *RF Max. Level* and *RF Mode* belong to the softkey *Analyzer Level).* The softkey/hotkey combinations provide test settings and switch over between different measurements.

Note: *The configuration settings made in the* Code Domain Power *applications (with either the softkeys or the* Configuration *menus) apply only to the measurements presented here. For example, configuration settings made here do not affect the configuration settings made within the* Power *or* Modulation *applications.*

The CDP measurement has its own environment (see Chapter 3, section Measurement Environments*). If the measurement environment is enabled in the configuration menu (see description in section Overview Configuration – Control on p. 4.47 ff.), it overrides the Connection Control parameters as long as the measurement is switched on (RUN) and a connection is established. All* CPP *measurement results are always obtained with the same parameter set.*

Refer to Table 4-4 *on page* 4.34 *for a list of measurements and their radio configuration requirements.*

All Code Domain Power measurements require a Reverse Radio Configuration 3 or 4.

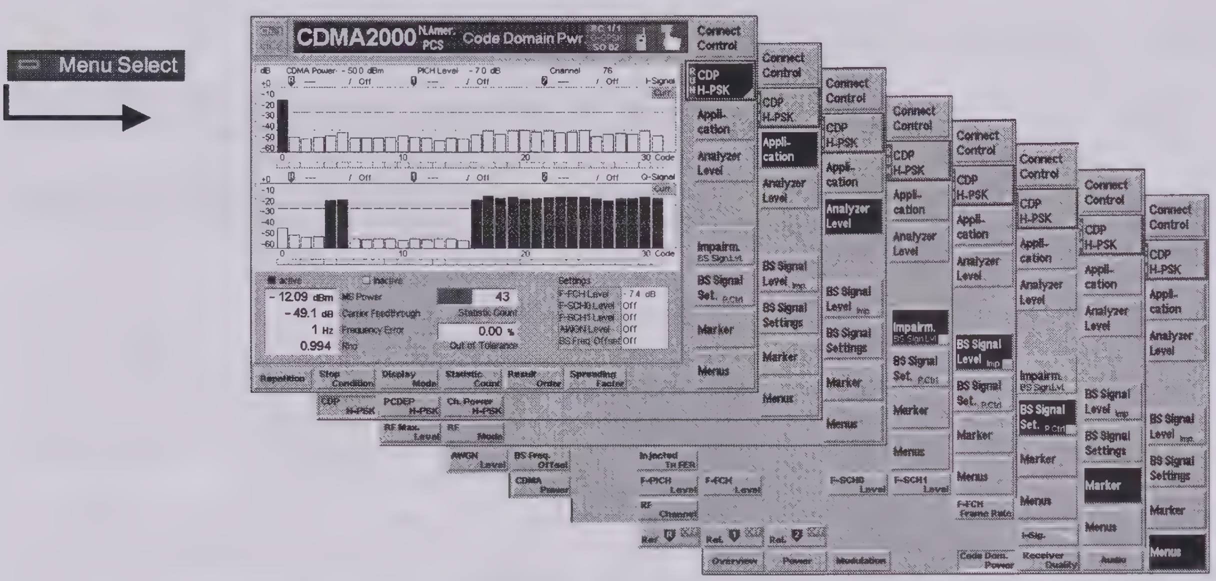


Figure 4-44 Code Domain Power measurement menu

Softkey Selections

Each *Code Domain Power* application is controlled by means of the measurement control softkey below the *Connect. Control* softkey and the associated hotkeys. The properties of the measurement control softkey are analogous in all measurements; see section *Analyzer/Generator – Measurement Control* in the *Non Signalling* section. The remaining softkeys select the application and provide application-specific settings.

The *Result Order* and *Spreading Factor* hotkeys associated to the measurement control softkey are only provided for the *CDP H-PSK* and *PCDEP H-PSK* measurement applications. See description on p. 4.91.

Appli-cation

The *Application* softkey activates a set of hotkeys to select a code domain power measurement application. When an application is selected, the corresponding measurement screen is displayed.

CDP H-PSK | **PCDEP H-PSK** | **Ch. Power H-PSK**

Note: *All Code Domain Power measurements require a reverse Radio Configuration 3 or 4; see Table 4-4 on p.* 4.34.

CDP H-PSK

The *CDP H-PSK* hotkey changes the power measurement application to measure the Code Domain Power of the mobile station.

Remote Control

The *CDP H-PSK* application is selected by the keyword `CDPW` in the 3rd level of the `CDPower` commands, e.g.
`CONFigure:CDPower:CDPW...`

PCDEP H-PSK

The *PCDEP H-PSK* hotkey changes the power measurement application to measure the Peak Code Domain Error Power of the mobile station.

Remote Control: The *PCDEP H-PSK* application is selected by the keyword `PCDep` in the 3rd level of the `CDPower` commands, e.g.
`CONFigure:CDPower:PCDep...`

Ch. Power H-PSK

The *Ch. Power H-PSK* hotkey changes the power measurement application to measure the Channel Power of the mobile station.

Remote Control: The *PCDEP H-PSK* application is selected by the keyword `CHPW` in the 3rd level of the `CDPower` commands, e.g.
`CONFigure:CDPower:CHPW...`

Analyzer Level Trg.

The *Analyzer Level/Trigger* softkey toggles between two sets of hotkeys to control the level in the RF signal path and define the trigger settings. These general settings are provided in the *Analyzer* and *Trigger* tabs of the *Connection Control* menu; see section *Analyzer Control (Connection Control – Analyzer)* on p. 4.141 ff and *Trigger (Connection Control – Trigger)* on p. 4.139 ff.

BS Signal Level Imp.

The *BS Signal Level / Imp.* softkey toggles between two sets of hotkeys to adjust the signal impairments and the base station signal levels.

All settings belong to the *Code Domain Power* measurement environment but are common to all CDP applications. They are also provided in the *Code Domain Power Configuration* menu and described in section *Power Configuration – Control* on p. 4.62 ff.

BS Signal Set. P. Ctrl

The *BS Signal Set. /P. Ctrl* softkey displays a set of hotkeys to adjust the RF channel and frame rate and the power control bits that the CMU sends to the mobile station to control its output power. *Frame Rate* and *Power Control Bits* belong to the *Overview* measurement environment and are also provided in the *Overview Configuration* menu (refer to section *Power Configuration – Control* on p. 4.62 ff.). *RF Channel* is a general parameter; see p. 4.126.

Marker Display

The *Marker/Display* softkey positions up to three markers and a baseline (D-Line) in the test diagram and outputs their values. Refer to page 4.145 for detailed information about markers.

The softkey is only available for applications *CDP H-PSK* and *PCDEP H-PSK*.

Menus

The *Menus* softkey displays the hotkey bar for switching to the other measurement menus.

Measurement Results

The CMU measures the code power of the mobile station's physical channels, resulting in the Code Domain Power measurement. Three applications are available for Code Domain Power measurements.

Code Domain Power (CDP) is the power of the individual Walsh code channels of the mobile station. The screen displays a bar graph of the power level of the individual channels. Both I and Q signal power is displayed. The evaluation can be done in code class 32 or 16, depending on the *Spreading Factor* setting (see p. 4.92). Moreover it is possible to change the order of the code channels in the bar graph *(Result Order)*.

Peak Code Domain Error Power (PCDEP) is the measured I/Q signal compared to an ideal reference signal.

Channel Power (Ch. Power H-PSK) is the power of the reverse physical channels of both the I and Q signal.

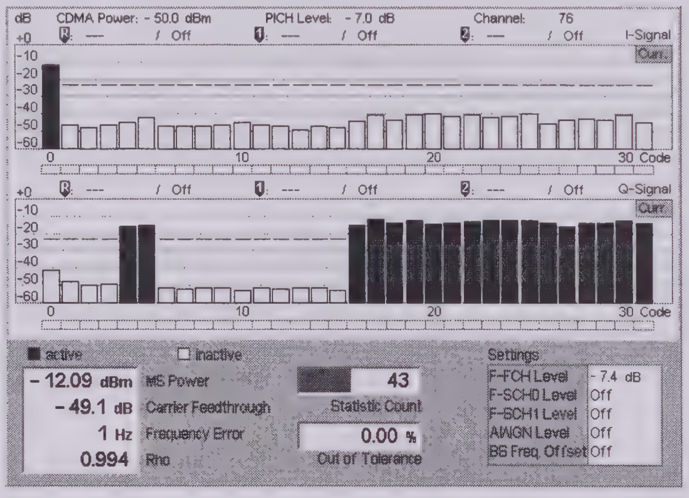
Measurement results are explained for each application.

Code Domain Power

Code Domain Power measures the individual power level of each code channel and presents the results as bar graphs. Both the I-Signal and Q-Signal power levels are displayed.

The measurement screen for Code Domain Power can be divided into three groups:

- Scalar measurement results (parameter lines)
- Bar graph
- Measurements and settings



Parameter lines 1 and 2

Measurement bar graphs

Measurements and Settings

CDMA Power: - 50.0 dBm PICH Level: - 7.0 dB Channel: 76

R: --- / Off 1: --- / Off 2: --- / Off I-Signal

R: --- / Off 1: --- / Off 2: --- / Off Q-Signal

- 12.09 dBm	MS Power
- 49.1 dB	Carrier Feedthrough
1 Hz	Frequency Error
0.994	Rho

43 Statistic Count

0.00 % Out of Tolerance

Settings

F-FCH Level	- 7.4 dB
F-SCH0 Level	Off
F-SCH1 Level	Off
AWGN Level	Off
BS Freq. Offset	Off

Figure 4-45 Display of measurement results (Code Domain Power screen)

Parameter Lines Scalar measurement results and settings are indicated in the two parameter lines above the test diagram and in the *Settings* table below.

1st Line The first parameter line contains the following settings:

Output Power	Total output power of the CMU, calculated as the sum of the forward CDMA power and the AWGN Level; see
PICH Level	PICH level as set by means of the *BS Signal Level* softkey
Channel	*RF Channel* set for the BS Signal

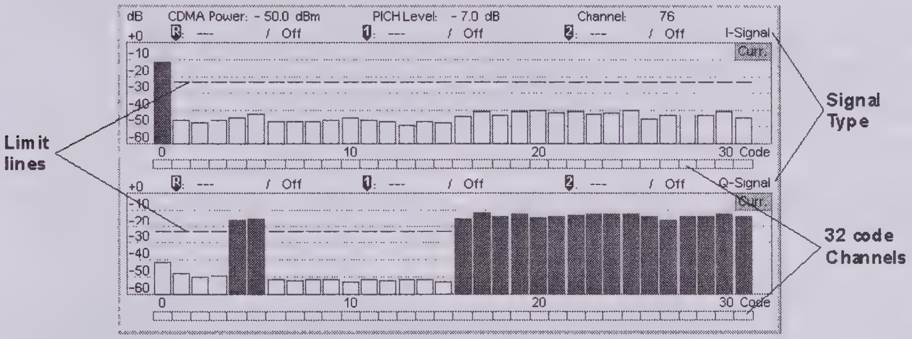
2nd Line The second parameter line contains the following marker values:

R	Level and time of reference marker
1	Level and time of marker 1 (setting *absolute*) and/or difference from reference marker (setting *relative*)
2	Level and time of marker 2 (setting *absolute*) and/or difference from reference marker (setting *relative*)

Measurement Bar Graphs The *Measurement bar graph* displays the power of each channel together with the limit lines and all active markers.

- The bar graph either shows the current, average, or maximum levels as set in the configuration menu.
- The limit lines provide a quick reference point to view inactive channels exceeding set limits; see *Limit Check* below.
- The *active* channels are indicated with a solid bar graph while the *inactive* are outlined (see the legend below the diagrams).

The number of bars in the graphs and their order can be customized by means of the *Spreading Factor* and *Bit Reverse* parameters; see section *Code Domain Power Configuration – Control* on p. 4.90 ff.



Limit lines

Signal Type

32 code Channels

Measurements and Settings The area below the bar graphs displays the results of power and waveform quality measurements. Measurements in red indicate they exceed the limit set in the configuration menu.

MS Power	*MS Power* is the total transmitted power level from the mobile station.
Carrier Feedthrough	*Carrier Feedthrough* refers to the origin offset, which is the magnitude of the RF carrier relative to the magnitude of the modulated carrier.
Frequency Error	*Frequency Error* is the difference between the nominal frequency of the selected channel and the measured frequency.
Rho	Rho is the ratio of the correlated power to the total power. The correlated power is a calculated vector between a corrected signal and an ideal reference. The corrected signal is created by removing phase, frequency, and timing offsets.
Statistic Count	*Statistic Count* defines the length of the statistic cycles in waveform intervals/evaluation periods.

Out of Tolerance	*Out of Tolerance* is the percentage of waveform intervals that exceed the defined limits.
Settings	The Settings window lists the most important settings made in either the Configuration Menu or the hotkeys.

Remote Control

```
READ[:SCALar]:CDPower:CDPW?
FETCh[:SCALar]:CDPower:CDPW?
SAMPle[:SCALar]:CDPower:CDPW?
```

Limit Check

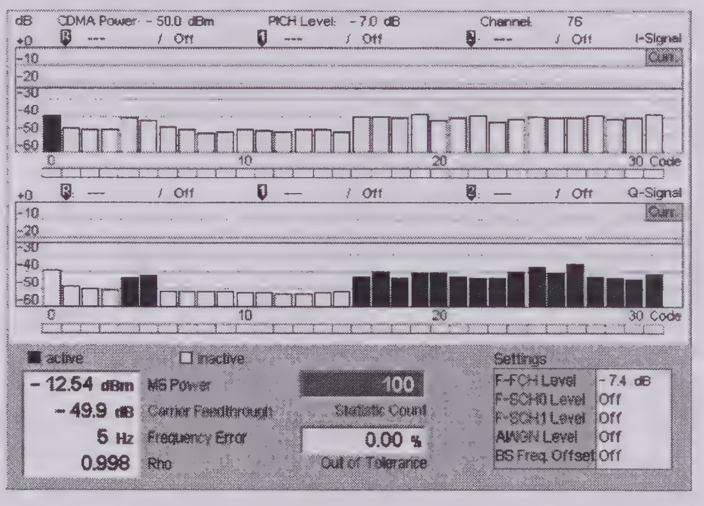
The limit lines visualize the upper limits for the CDP in all inactive I and Q channel contributions as set in the *Limits tab* of the configuration menu. When an inactive channel contribution exceeds the limit, the corresponding section of the limit check bar below the diagram turns red.

The *IQ Leakage Check* parameter (see p. 4.94) can be used to restrict the limit check to restricts the limit check to code channels with inactive I and Q contributions.

Peak Code Domain Error Power

Peak Code Domain Error Power (PCDEP) displays the error signal over the code domain channels. The error is the difference between the measured signal and the ideal reference signal.

Besides all settings and results are analogous the *Code Domain Power* results described in section *Code Domain Power* on p. 4.86 ff.



Parameter lines 1 and 2

Measurement bar graphs

Measurements and Settings

CDMA Power - 50.0 dBm PICH Level: - 7.0 dB Channel: 76

- 12.54 dBm	MS Power
- 49.9 dB	Carrier Feedthrough
5 Hz	Frequency Error
0.998	Rho

Statistic Count: 100

Out of Tolerance: 0.00 %

Settings

F-FCH Level	- 7.4 dB
F-SCH0 Level	Off
F-SCH1 Level	Off
AWGN Level	Off
BS Freq. Offset	Off

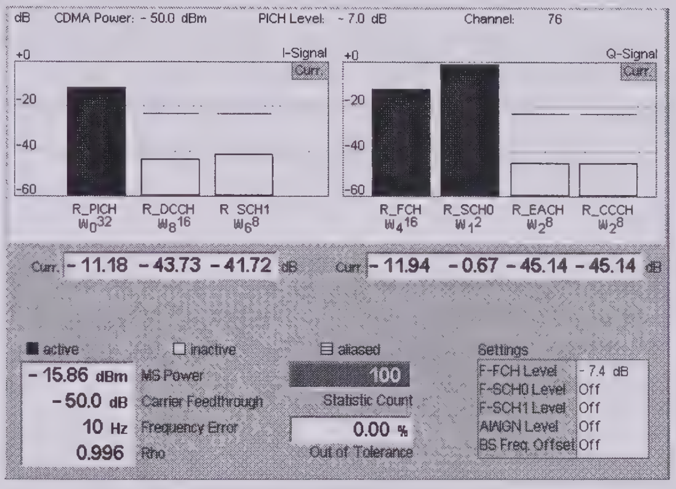
Figure 4-46 Display of measurement results (Code Domain Error Power screen)

Channel Power

Channel Power (Ch. Power H-PSK) is the power of the reverse physical channels of both the I and Q signal.

The measurement screen for Code Domain Channel Power can be divided into three groups:

- Scalar measurement results (parameter lines)
- Bar Graph
- Measurements and Settings



Parameter lines 1 and 2

Measurement graph

Measurements and settings

dB CDMA Power: - 50.0 dBm PICH Level: - 7.0 dB Channel: 76

Curr. - 11.18 - 43.73 - 41.72 dB

Curr. - 11.94 - 0.67 - 45.14 - 45.14 dB

- 15.86 dBm MS Power
- 50.0 dB Carrier Feedthrough
10 Hz Frequency Error
0.996 Rho

100 Statistic Count

0.00 % Out of Tolerance

Settings	
F-FCH Level	- 7.4 dB
F-SCH0 Level	Off
F-SCH1 Level	Off
AWGN Level	Off
BS Freq. Offset	Off

Figure 4-47 Display of measurement results (Channel Power screen)

Parameter Lines and Settings Scalar measurement results and settings are indicated in the parameter line above the test diagram and in the *Settings* table below.

The first parameter line and the *Settings* table is identical to the *Code Domain Power* application; see section *Code Domain Power* on p. 4.86 ff. The second parameter line is omitted as no markers are available.

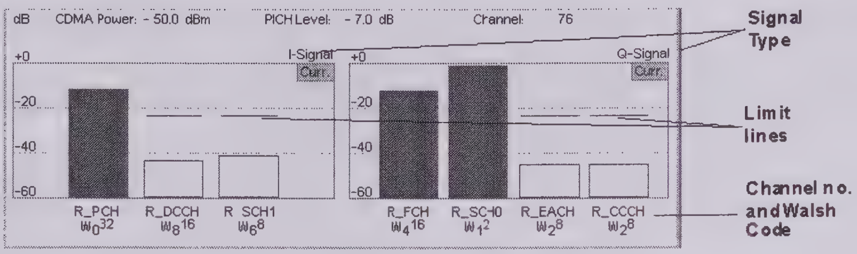
Measurement Bar Graphs The *Measurement bar graph* is displays the power of each channel together with the limit lines.

The bar graph either shows the current, average, or maximum levels as set in the configuration menu.

The limit lines provide a quick reference point to view channels exceeding set limits. The limit line level is set in the Configuration Menu.

The *active* channels are indicated with a solid bar graph while the *inactive* are outlined (see the legend below the diagrams). Aliased channels are indicated with a lined bar graph. An aliased channel is a code channel that is not active in the current radio configuration but assigned to a different physical channel so that it receives power (e.g. the R-EACH is aliased if the R-SCH0 is active).

Below each bar graph is its measured value.



Measurements and Settings This area displays the results of power and waveform quality measurements. Measurements in red indicate they exceed the limit set in the Configuration Menu.

The values are identical to the *Code Domain Power* application; see section *Code Domain Power* on p. 4.86 ff.

Remote Control
```
READ[:SCALar]:POWer:CHPW?
FETCh[:SCALar]:POWer:CHPW?
SAMPle[:SCALar]:POWer:CHPW?
```

Code Domain Power Configuration

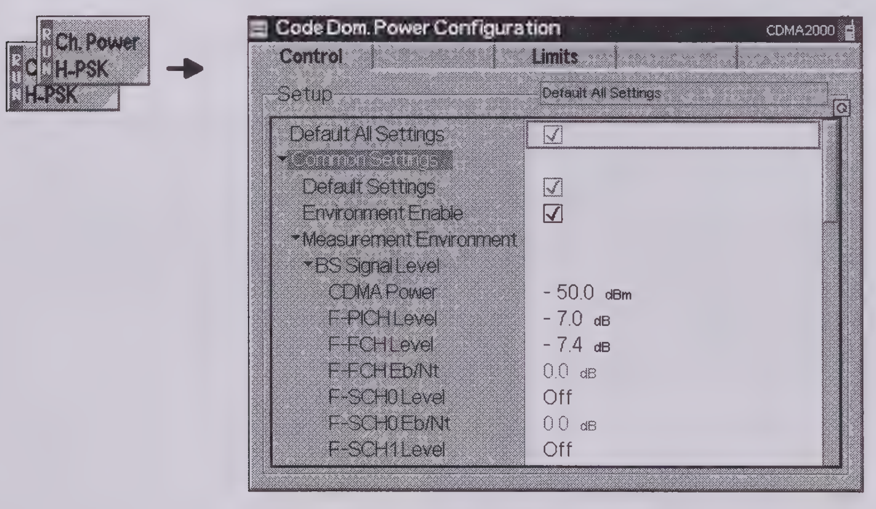
The popup menu *Code Domain Power Configuration* contains tabs to define the parameters of each code domain power application including the error tolerances.

Pressing the measurement softkey twice (once if already selected) opens the popup menu *Code Domain Power Configuration*. Use the hotkeys at the bottom of the screen to change between the tabs. Use the roll-key to expand or compress the list of displayed settings.

Code Domain Power Configuration – Control

The *Control* tab controls each of the measurement applications. Each application lists the available settings for controlling the measurement.

The control settings consist of *Common Settings* (settings that affect all code domain power applications) followed by settings specific to an application.



Setup: Default All Settings

Default All Settings ☑
Common Settings
  Default Settings ☑
  Environment Enable ☑
  Measurement Environment
    BS Signal Level
      CDMA Power - 50.0 dBm
      F-PICH Level - 7.0 dB
      F-FCH Level - 7.4 dB
      F-FCH Eb/Nt 0.0 dB
      F-SCH0 Level Off
      F-SCH0 Eb/Nt 0.0 dB
      F-SCH1 Level Off

Figure 4-48 Code Domain Power Configuration – Control

All settings may not be available for all CDP measurement applications. The statistical settings *Repetition, Stop Condition, Statistic Count,* and *Display Mode* have the same meaning in all measurements (except the *Stop Condition* in *Receiver Quality;* see section *Receiver Quality Configuration – Control* on p. 4.100 ff.); they are described in section *Overview Configuration – Control* on p. 4.47 ff. The *Display Mode* applies to the values in the bar graphs only.

Most other parameters are analogous to the corresponding *Power* settings and described in section *Power Configuration – Control* on p. 4.62 ff. The following parameters are not provided in the *Power Configuration* menu:

Code Domain Power/
Peak C.D. Error Power/

Result Order

Result Order defines the method used to display the code channels; see background information below. This setting is only available for *Code Domain Power* and *Peak Code Domain Error* measurement applications.

Hadamard The code channels are displayed in the order determined by the Hadamard matrix. The codes are numbered as Walsh codes W_n^{SF}, where SF is the *Spreading Factor;* see below.

The reverse CDMA2000 channels use fixed Walsh codes with SFs ranging from 2 to 32; see standard TIA/EIA/IS-2000.2-A and *Table 4-6* below. The Walsh code numbers n can be read directly from the measurement bar graphs. Channels with a SF < 32 (<16, if a *Spreading Factor* of 16 is selected) and therefore higher data rate are displayed with several active bars. .

Bit reverse The code channels are displayed in the order defined by the Orthogonal Variable Spreading Factor (OVSF) code tree so that related code channels are adjacent to each other. This ensures that high data rate channels with smaller SF are always displayed as one contiguous block.

Remote Control

```
CONFigure:CDPower:CDPW:CONTrol:RORDer
CONFigure:CDPower:PCDEP:CONTrol:RORDer
HADamard | BITReverse
```

Table 4-6 Walsh codes for reverse CDMA2000 channels

Channel Type	Walsh Function
Reverse Pilot Channel	W_0^{32}
Enhanced Access Channel	W_2^{8}
Reverse Common Control Channel	W_2^{8}
Reverse Dedicated Control Channel	W_8^{16}
Reverse Fundamental Channel	W_4^{16}
Reverse Supplemental Channel 1	W_1^{2} or W_2^{4}
Reverse Supplemental Channel 2	W_2^{4} or W_6^{8}

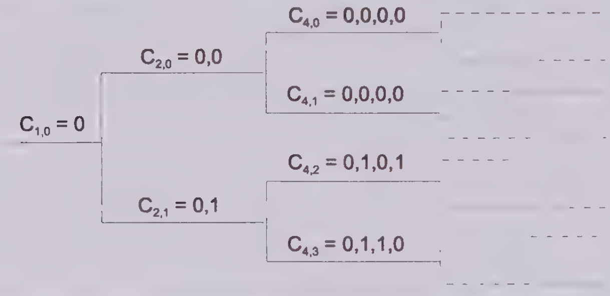
Walsh codes and OVSF codes

According to standard TIA/EIA/IS-2000.2-A, CDMA2000 channels are spread using orthogonal Walsh functions W_n^{SF} that are serially constructed from a SF x SF Hadamard matrix. Hadamard matrices can be generated by means of the following recursive procedure:

$$H_1 = 0, \quad H_2 = \begin{matrix} 0 & 0 \\ 0 & 1 \end{matrix}, \quad H_{2N} = \begin{matrix} H_N & H_N \\ H_N & \overline{H_N} \end{matrix};$$

where N is a power of 2 and $\overline{H}_N$ denotes the binary complement of H_n.

Orthogonal Variable Spreading Factor codes provide an alternative scheme of generating codes that preserve orthogonality between channels with different rates and spreading factors. According to standard 3GPP TS 25.213, they are generated using the following code tree:



For a given spreading factor SF, Walsh codes and OVSF codes can be derived from each other by assigning code numbers in binary format. The Walsh code no. n is equal to the OVSF code number m and vice versa, provided that m and n have inverse binary representation (n is converted into m by reversing the order of bits in the binary representation of n). For numbers with symmetrical binary representation (e.g 00 or 1001), the Walsh code and OVSF code numbers are equal.

E.g. for spreading factor SF = 4, the two schemes provide the following codes:

Hadamard (Walsh codes)			**Bit reverse (OVSF codes)**		
Code (SF = 4)	Code number Dec.	Binary	Code (SF = 4)	Code number Dec.	Binary
0 0 0 0	0	00	0 0 0 0	0	00
0 1 0 1	1	01	0 0 1 1	1	01
0 0 1 1	2	10	0 1 0 1	2	10
0 1 1 0	3	11	0 1 1 0	3	11

To obtain the *Bit reverse* representation from the *Hadamard* representation, the codes no. 01 and 10 (binary) must be interchanged.

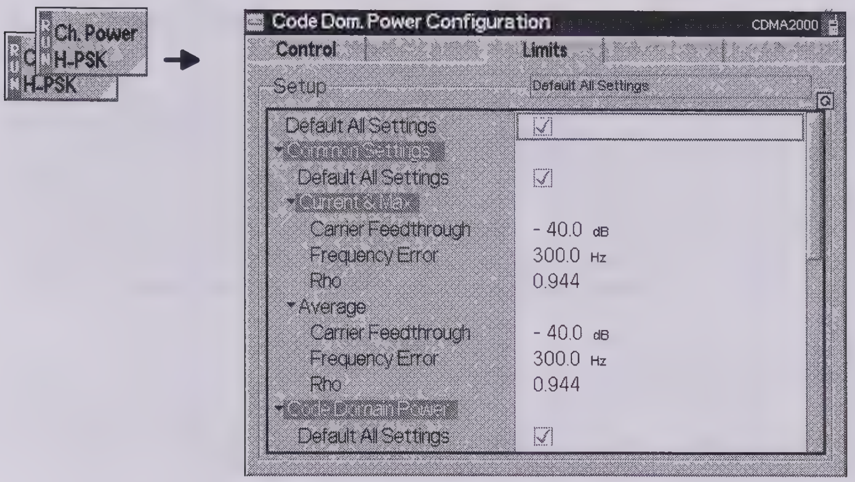
Spreading Factor *Spreading Factor* selects the code class in which the uplink CDMA signal is evaluated and is equal to the number of bars displayed in the CDP H-PSK and PCDEP H-PSK applications. Together with the *Result Order* parameter, it can be used to optimize the evaluation and the screen display. Spreading factors of 32 or 16 are provided.

Remote Control
`CONFigure:CDPower:CDPW:CONTrol:SFACtor`
`CONFigure:CDPower:PCDEP:CONTrol:SFACtor`

Code Domain Power Configuration – Limits

The *Limits* tab defines tolerance limits for each of the Code Domain Power measurement applications.

The limits settings consist of both Common settings (settings that affect all code domain power applications) and then settings specific to an application.



Setup: Default All Settings

- Default All Settings ☑
- Common Settings
  - Default All Settings ☑
  - Current & Max
    - Carrier Feedthrough - 40.0 dB
    - Frequency Error 300.0 Hz
    - Rho 0.944
  - Average
    - Carrier Feedthrough - 40.0 dB
    - Frequency Error 300.0 Hz
    - Rho 0.944
- Code Domain Power
  - Default All Settings ☑

Figure 4-49 Code Domain Power Configuration – Limits

Default All Settings The *Default All Settings* switch assigns default values to all parameters of the modulation *Limits* tab (the default values are quoted in the command description in chapter 6 of this manual). Additional default switches are provided for common limit settings and for the individual applications.

Remote control
`DEFault:CDPower:<Application>:LIMit  ON | OFF`

Common Settings *Common Settings* are settings that affect all code domain power applications.

Current & Max Sets the limits used when the display is set to the *Current* or *Min/Max* display mode.

Carrier Feedthr. Upper limit for the difference between magnitude of the RF carrier and the modulated carrier.

Frequency Error Upper limit for the difference between the measured and the expected frequency of the signal.

Rho Upper limit of the ratio of the correlated power and the total power.

Remote Control
```
CONFigure:CDPower:CPCCommon:CMAX:LIMit:ASYMmetric
[:COMBined]
<Carrier Feedthrough Limit>, <Freq Error Limit>, <Rho Limit>
```

Average Sets the limits used when the display is set to the Average display mode. The available settings are the same as described for the Current & Max display mode.

Remote Control
```
CONFigure:CDPower:CPCCommon:AVERage:LIMit:ASYMmetric
[:COMBined]
<Carrier Feedthrough Limit>, <Freq Error Limit>, <Rho Limit>
```

CDP	*CDP* contains the limit settings applicable to the *Code Domain Power.*
IQ Leakage Check	Decouples the limit check in the I and Q branches. *On (box checked)* The limit check fails if any of the inactive I and Q channel contributions exceeds the (upper) limit for the code domain power. *Off (box unchecked)* The limit check is restricted to inactive code channels. Each code channel with an active I or Q contribution is considered to meet the specifications, irrespective of the code domain power in the inactive branch.
Remote Control	`CONFigure:CDPower:CDPW:LIMit:IQLCheck  ON │ OFF`
Current & Max	Sets the limits used when the display is set to the Current or Min/Max display mode.
CDP Limit	Value (and placement) of the limit line displayed on the measurement screen. The limit line indicates the upper limit for the CDP in all inactive I and Q channel contributions. See also *Leakage Check* parameter above.

Remote Control	`CONFigure:CDPower:CDPW:CMax:LIMit:ASYMmetric`
	`[:COMBined]`
	`<CDP Limit Y>`

Average	Sets the limits used when the display is set to the Average display mode. The available settings are the same as described for the Current & Max display mode.

Remote Control	`CONFigure:CDPower:CDPW:AVERage:LIMit:ASYMmetric`
	`[:COMBined]`
	`<CDP Limit Y>`

PCDEP	*PCDEP* contains the upper limit settings applicable to the *Peak Code Domain Error Power*. The upper PCDEP limit check is done for all active and inactive channels.

Remote Control	`CONFigure:CDPower:PCDEP:CMax:LIMit:ASYMmetric`
	`[:COMBined]`
	`CONFigure:CDPower:PCDEP:AVERage:LIMit:ASYMmetric`
	`[:COMBined]`
	`<CDP Limit Y>`

CHP	*CHP* contains the limit settings applicable to the *Channel Power.* The available settings are the same as described for the *CDP.*

Remote Control	`CONFigure:CDPower:CHPW:CMax:LIMit:ASYMmetric`
	`[:COMBined]`
	`CONFigure:CDPower:CHPW:AVERage:LIMit:ASYMmetric`
	`[:COMBined] <CDP Limit Y>`

Receiver Quality Measurements

The menu group *Receiver Quality* measures parameters that characterize the transmission quality of the complete transmission path from the CMU to the device under test (mobile station) and back. Assuming no transmitter errors, this allows assessment of the mobile station's receiver performance at various RF power levels.

The *Receiver Quality* menu is opened from the *Menu Select* menu or from any other measurement menu in *CDMA2000 Signalling* using the hotkey *Menu – Receiver Quality* (see *Figure 4-50*). The initial screen returns to the modulation application last accessed.

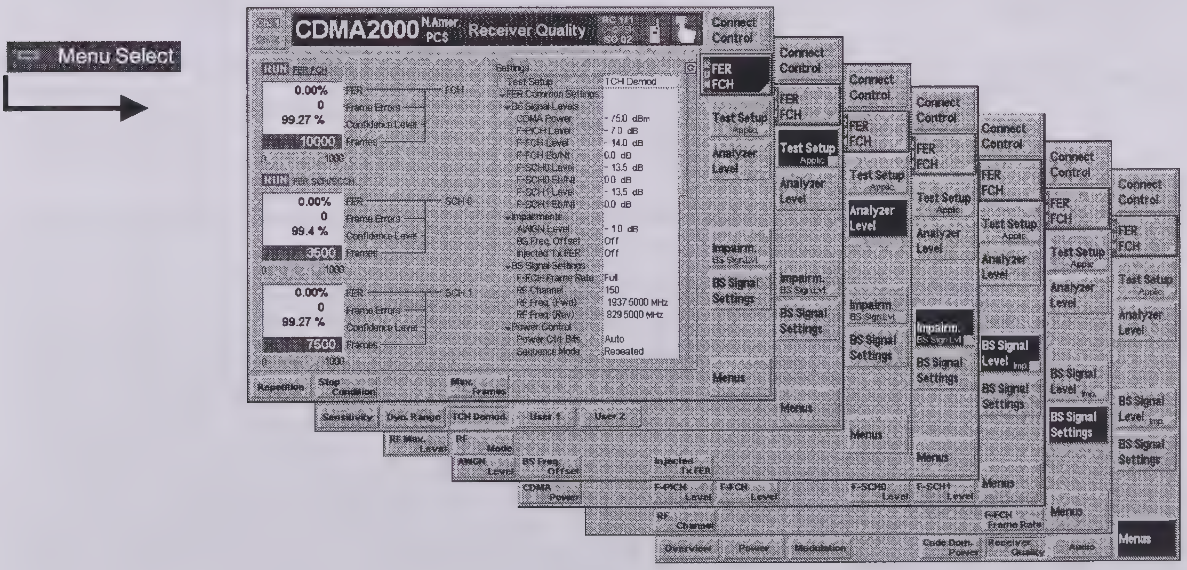
Note: *The configuration settings made in the* Receiver Quality *applications (with either the softkeys or the* Configuration *menus) apply only to the measurements presented here. For example, configuration settings made here do not affect the configuration settings made within the* Power *or* Modulation *applications.*

The Receiver Quality *measurement has its own environment (see Chapter 3, section* Measurement Environments*). If the measurement environment is enabled in the configuration menu (see description in section Overview Configuration – Control on p. 4.47 ff.), it overrides the Connection Control parameters as long as the measurement is switched on (RUN) and a connection is established. All* Receiver Quality *measurement results are always obtained with the same parameter set.*

Refer to Table 4-4 *on page* 4.34 *for a list of measurements and their radio configuration requirements.*

Receiver Quality measurements require either a connection with Loopback Service or Test Data Service Option.

The measurements in the menu group *Receiver Quality* require an established call (signalling state *Connected)* in the *Loopback Service* or the *Test Data Service* mode (see *1st Service Class* softkey on p. 4.37). Receiver Quality measurements cannot be performed in the *Speech Service* mode.



FER 0.00%
Frame Errors 0
Confidence Level 99.27 %
Frames 10000

FER 0.00%
Frame Errors 0
Confidence Level 99.4 %
Frames 3500

FER 0.00%
Frame Errors 0
Confidence Level 99.27 %
Frames 7500

Settings
Test Setup: TCH Demod
FER Common Settings
BS Signal Levels
CDMA Power: - 75.0 dBm
F-PICH Level: - 7.0 dB
F-FCH Level: - 14.0 dB
F-FCH Eb/Nt: 0.0 dB
F-SCH0 Level: - 13.5 dB
F-SCH0 Eb/Nt: 0.0 dB
F-SCH1 Level: - 13.5 dB
F-SCH1 Eb/Nt: 0.0 dB
Impairments
AWGN Level: - 1.0 dB
BS Freq. Offset: Off
Injected Tx FER: Off
BS Signal Settings
F-FCH Frame Rate: Full
RF Channel: 150
RF Freq. (Fwd): 1937.5000 MHz
RF Freq. (Rev): 829.5000 MHz
Power Control
Power Ctrl. Bits: Auto
Sequence Mode: Repeated

Figure 4-50 Receiver Quality Measurement menu

Softkey Selections

Each *Receiver Quality* application is controlled by means of the measurement control softkey below the *Connect. Control* softkey and the associated hotkeys. The properties of the measurement control softkey are analogous in all measurements; see section *Analyzer/Generator – Measurement Control* in the *Non Signalling* section. The remaining softkeys select the application and provide application-specific settings.

The *Max Frames* hotkey associated to the measurement control softkey is only provided for the *CDP H-PSK* and *PCDEP H-PSK* measurement applications. See description on p. 4.101

Applic.
Test Setup

The *Application* softkey activates a set of hotkeys to select a receiver quality measurement application. When an application is selected, the corresponding measurement screen is displayed.

FER FCH

The *FER FCH* hotkey selects the FCH frame error measurement as the measurement under control allowing you to control and make adjustments to the FCH frame error measurement.

Remote Control
The *FER FCH* application is selected by the keywords `FER:FCH` in the 3rd and 4th level of the `RXQuality` commands, e.g.
`CONFigure:RXQuality:FER:FCH...`

FER
SCH/SCCH

The *FER SCH/SCCH* hotkey selects the SCH/SCCH frame error measurement as the measurement under control allowing you to control and make adjustments to the FCH frame error measurement.

Remote Control
The *FER SCH/SCCH* application is selected by the keywords `FER:SCHScch` in the 3rd and 4th level of the `RXQuality` commands, e.g.
`CONFigure:RXQuality:FER:SCHScch...`

Fwd. Power
Control

The *Fwd. Power Control* hotkey displays the forward power control measurement.

Remote Control
The *Fwd. Power Control* application is selected by the keywords `FPControl` in the 3rd and 4th level of the `RXQuality` commands, e.g.
`CONFigure:RXQuality:FPControls...`

Test Setup
Applic.

The *Test Setup* softkey displays a set of hotkeys to select one of the test setups to use as the parameters for the receiver quality test.

Remote Control
`CONFigure:RXQuality:FER:FSSCommon:TSETup`
`<Test Setup>`

Sensitivity

The *Sensitivity* hotkey contains predefined parameter settings to test the receiver quality as defined in standard TIA/EIA IS-2000 for sensitivity testing.

Dyn. Range

The *Dynamic Range* hotkey contains predefined parameter settings to test the receiver quality as defined in standard TIA/EIA IS-2000 for dynamic range testing.

TCH Demod.	The *Traffic Channel Demodulation* hotkey contains predefined parameter settings to test the receiver quality as defined in standard TIA/EIA IS-2000 for traffic channel demodulation testing.
User 1	The *User 1* hotkey is available to store user defined parameters to test receiver quality.
User 2	The *User 2* hotkey is available to store user defined parameters to test receiver quality.
Analyzer Level Trg.	The *Analyzer Level/Trigger* softkey toggles between two sets of hotkeys to control the level in the RF signal path and define the trigger settings. These general settings are provided in the *Analyzer* and *Trigger* tabs of the *Connection Control* menu; see section *Analyzer Control (Connection Control – Analyzer)* on p. 4.141 ff and *Trigger (Connection Control – Trigger)* on p. 4.139 ff.
BS Signal Level Imp.	The *BS Signal Level / Imp.* softkey toggles between two sets of hotkeys to adjust the signal impairments and the base station signal levels. All settings belong to the *Receiver Quality* measurement environment but are common to all *Receiver Quality* test setups. They are also provided in the *Receiver Quality Configuration* menu and described in section *Power Configuration – Control* on p. 4.62 ff.
BS Signal Set. P. Ctrl	The *BS Signal Set. /P. Ctrl* softkey displays a set of hotkeys to adjust the RF channel and frame rate and the power control bits that the CMU sends to the mobile station to control its output power. *Frame Rate* and *Power Control Bits* belong to the *Overview* measurement environment and are also provided in the *Overview Configuration* menu (refer to section *Power Configuration – Control* on p. 4.62 ff.). *RF Channel* is a general parameter; see p. 4.126.
Menus	The *Menus* softkey displays the hotkey bar for switching to the other measurement menus.

Measurement Results

The Receiver Quality measurements are based on the comparison of the output signal sent by the CMU with the signal received and decoded by the device under test (mobile station).

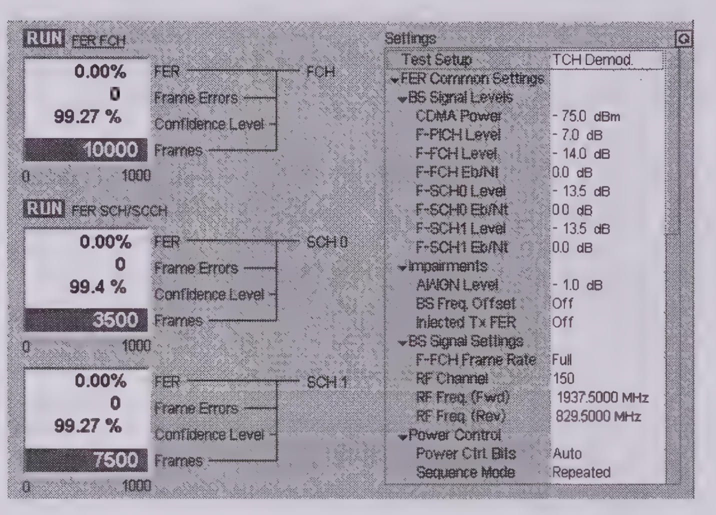
The mobile station must return the received signal to the CMU in loop back mode.

Because of the higher signal level, the transmission errors produced on the way back (from the mobile station to the CMU) can usually be neglected. However, frames destroyed on the way back are detected in a cyclic redundancy check (CRC) and counted. They are not taken into account in the calculation of transmission errors.

The quality of the mobile station transmitter can be tested separately in the *Modulation* measurement.

Frame Error Rate (FCH and SCH/SCCH)

Frame Error Rate measures the percentage of frame errors over the total number of frames received. Both the fundamental channel (FCH) and supplemental channels (SCH0 and 1/SCCH) can be monitored with the same measurement screen.



FER FCH:
0.00% FER
0 Frame Errors
99.27 % Confidence Level
10000 Frames

FER SCH/SCCH, SCH 0:
0.00% FER
0 Frame Errors
99.4 % Confidence Level
3500 Frames

SCH 1:
0.00% FER
0 Frame Errors
99.27 % Confidence Level
7500 Frames

Settings	
Test Setup	TCH Demod.
FER Common Settings	
BS Signal Levels	
CDMA Power	- 75.0 dBm
F-PICH Level	- 7.0 dB
F-FCH Level	- 14.0 dB
F-FCH Eb/Nt	0.0 dB
F-SCH0 Level	- 13.5 dB
F-SCH0 Eb/Nt	0.0 dB
F-SCH1 Level	- 13.5 dB
F-SCH1 Eb/Nt	0.0 dB
Impairments	
AWGN Level	- 1.0 dB
BS Freq. Offset	Off
Injected Tx FER	Off
BS Signal Settings	
F-FCH Frame Rate	Full
RF Channel	150
RF Freq. (Fwd)	1937.5000 MHz
RF Freq. (Rev)	829.5000 MHz
Power Control	
Power Ctrl. Bits	Auto
Sequence Mode	Repeated

Figure 4-51 Frame error rate measurement (Receiver Quality)

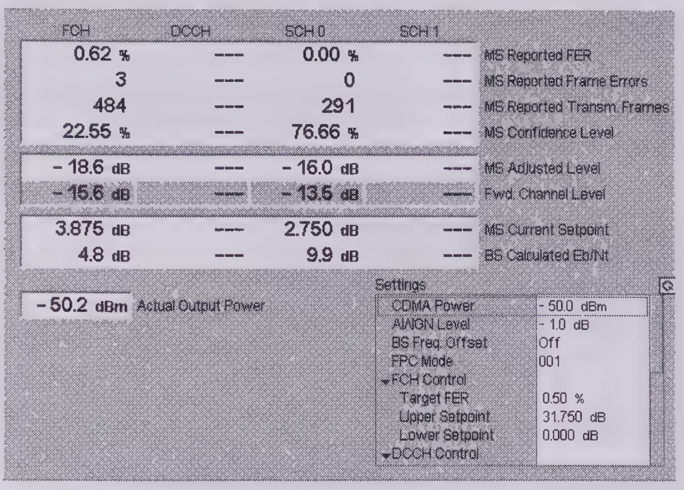
FER	*FER* displays the percentage of the Frame Error Rate over the total number of received frames.
Frame Errors	*Frame Errors* lists the total number of frame errors.
Frames Received	*Frames Received* lists the total number of frames received. This number is used for the calculation of the FER.
Confidence Level	*Confidence Level* indicates the statistical probability that the true FER is within limits based on the current number of frame errors compared to the number of frames received.
Frames	*Frames* is a bar graph indicating the measurement progress.

Forward Power Control

Forward Power Control (FPC) displays the receiver quality measurements of the Fundamental channels and Supplemental channels reported from the mobile station. FPC allows the mobile station to direct the power level for the forward fundamental channel using the reverse power control subchannel. This is achieved by the mobile station comparing the E_b/N_t (dB) value provided by the inner power control loop with the corresponding outer power control loop setpoint to determine the power control bits ('0' or '1') to be sent on the Reverse Power Control Subchannel.

Periodic reporting is enabled to receive the mobile station's achieved E_b/N_t and the frame error rate statistics from the PMRM (Power Measurement Report Message).

The Forward Power Control screen displays four columns for each measurement: Fundamental Channel, Dedicated Control Channel, Supplemental Channel 0, and Supplemental Channel 1. At this time, no values are returned for the Dedicated Control Channel and Supplemental Channel 1.



FCH	DCCH	SCH 0	SCH 1	
0.62 %	---	0.00 %	---	MS Reported FER
3	---	0	---	MS Reported Frame Errors
484	---	291	---	MS Reported Transm. Frames
22.55 %	---	76.66 %	---	MS Confidence Level
- 18.6 dB	---	- 16.0 dB	---	MS Adjusted Level
- 15.6 dB	---	- 13.5 dB	---	Fwd. Channel Level
3.875 dB	---	2.750 dB	---	MS Current Setpoint
4.8 dB	---	9.9 dB	---	BS Calculated Eb/Nt

- 50.2 dBm Actual Output Power

Settings

CDMA Power	- 50.0 dBm
AWGN Level	- 1.0 dB
BS Freq. Offset	Off
FPC Mode	001
FCH Control	
Target FER	0.50 %
Upper Setpoint	31.750 dB
Lower Setpoint	0.000 dB
DCCH Control	

Figure 4-52 Forward power control measurement (Receiver Quality)

MS Reported FER	*MS Reported FER* displays the percentage of the Frame Error Rate over the total number of received frames reported by the mobile station.
MS Reported Frame Errors	*MS Reported Frame Errors* displays the total number of frame errors reported by the mobile station.
MS Reported Transm. Frames	*MS Reported Transm* displays the total number of frames the mobile station has transmitted. This number is used for the calculation of the FER.
MS Reported Confidence Level	*MS Reported Confidence Level* displays the statistical probability that the FER is within limits based on the current number of frame errors compared to the number of frames received.
MS Adjusted Level	*MS Adjusted Level* displays the mobile station's reported channel power level.
Fwd. Channel Level	*Fwd. Channel Level* displays the forward channel power level.
MS Current Setpoint	*MS Current Setpoint* displays the mobile stations setpoint. The setpoint is confined within the settings of the minimum and maximum setpoint settings.
BS Calculated E_b/N_t	*BS Calculated E_b/N_t* displays the calculated bit energy.
Actual Output Power	*Actual Output Power* displays the output power of the CMU.

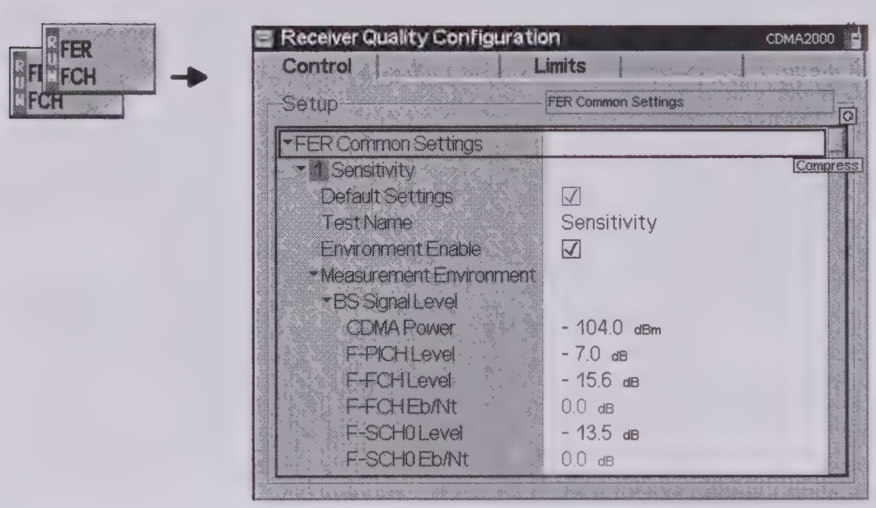
Receiver Quality Configurations

The popup menu *Receiver Quality Configuration* contains three tabs to set the parameters of the receiver Quality measurements.

Pressing the measurement softkey at the top right in the measurement menu twice (once if already selected) activates the popup menu *Receiver Quality Configuration*. It is possible to change between the tabs by pressing the associated hotkeys. Use the roll-key to expand or compress the list of settings displayed.

Receiver Quality Configuration – Control

The *Control* tab contains all user adjustable configuration parameters to control each receiver quality measurement. The *Control* tab has two major divisions, *FER Common Settings* and *FERFCH*. The *Common Settings* division adjust signal levels for each test setup and allows the user to create and name new test setups. FERRCH defines how the tests are performed.



Setup: FER Common Settings

FER Common Settings
Sensitivity
Default Settings ☑
Test Name Sensitivity
Environment Enable ☑
Measurement Environment
BS Signal Level
CDMA Power - 104.0 dBm
F-PICH Level - 7.0 dB
F-FCH Level - 15.6 dB
F-FCH Eb/Nt 0.0 dB
F-SCH0 Level - 13.5 dB
F-SCH0 Eb/Nt 0.0 dB

Figure 4-53 Receiver Quality Configuration Control

All settings may not be available for all *Receiver Quality* measurement applications. The statistical setting *Repetition* has the same meaning in all measurements; it is described in section *Overview Configuration – Control* on p. 4.47 ff.

Most other parameters are analogous to the corresponding *Power* settings and described in section *Power Configuration – Control* on p. 4.62 ff. The following parameters are not provided in the *Power Configuration* menu or have a different function:

Test Name The *Test Name* allows you to enter a descriptive name for the test based on the parameters you set. The default test names can be renamed to more accurately describe your tests or you can create two new tests using the User1 and User2 selections. The name entered here displays in the hotkey bar of the *Test Setup* softkey.

Default Settings *Default Settings* (located below each *Test Name*) assigns default values to the parameters of the test setup.

Remote Control
`DEFault:RXQuality:FER:FSSCommon:TSETup<nr>  ON | OFF`
`DEFault:RXQuality:FER:FCH:CONTrol:TSETup<nr>  ON | OFF`
`DEFault:RXQuality:FER:SCHScch:CONTrol:TSETup<nr>  ON | OFF`

BS Signal Level

F-SCH0 Level The *F-SCH0 Level* adjusts the signal level of the Supplemental Channel 0 in the forward CDMA channel. This is a common setting used for each of the Code Domain Power applications.

F-SCH1 Level The forward supplemental channel 1 is not supported at this time.

Stop Condition *Stop Condition* selects one of several stop conditions for the measurement:

NONE Continue the measurement even in the event of errors.

Confidence Limit Exceeded:	Stop the measurement when the confidence level exceeds the set limit. This indicates the probability that the true FER is less than the set FER limit.
Frame Limit Exceeded:	Stop the measurement when the number of frame errors exceed the set limit.
Any Limit Exceeded:	Stop the measurement if either the *Confidence Limit* or *Frame Limit* is exceeded.

The stop conditions may affect single-shot and continuous measurement settings.

Remote Control
```
CONFigure:RXQuality:FER:FCH:CONTrol:TSETup<nr>:REPetition
CONFigure:RXQuality:FER:SCHScch:CONTrol:TSETup<nr>:REPetition
<Repetition>, <Stop Cond>, <Step Mode>
```

Max Frames The *Max Frames* sets the number of frames used to calculate the frame error rate.

Remote Control
```
CONFigure:RXQuality:FER:FCH:CONTrol:TSETup<nr>:FRAMes
CONFigure:RXQuality:FER:SCHScch:CONTrol:TSETup<nr>:FRAMes
<Frame Count>
```

The following additional settings apply to application ***Forward Power Control:***

FPC Mode *FPC Mode* defines the forward power control operating mode. The different modes control the number of power control bits used to monitor the traffic channels. A total of 800 control bits are available. The mode can be set between 0 and 2 (binary format).

000	All 800 bits are used to monitor the FCH channel
001	400 bits are used to monitor the FCH, 400 bits to monitor the SCH0
010	200 bits are used to monitor the FCH, 600 bits used to monitor the SCH0

Remote Control
```
CONFigure:RXQuality:FPControl:CONTrol:FPCMode
<Mode>
```

Report Frames *Report Frames* is the number of frames for the mobile station to use to compile the PMRM (Power Measurement Report Message) data.

Remote Control
```
CONFigure:RXQuality:FPControl:CONTrol:RFRames
<Frames>
```

Report Delay Number of frames to delay before restarting the error statistics collection.

Remote Control
```
CONFigure:RXQuality:FPControl:CONTrol:RDELay
<Delay>
```

Primary Channel Primary fundamental traffic channel. FCH is the only available selection.

Remote Control
```
CONFigure:RXQuality:FPControl:CONTrol:CPRimary
<Primary>
```

Secondary Channel Supplemental traffic channel SCH0 is the only available selection.

Remote Control
```
CONFigure:RXQuality:FPControl:CONTrol:CSECondary
<Secondary>
```

FCH Control

Target FER

Target FER sets a Frame Error Rate target (percentage of error) for the mobile station to achieve. The mobile station continually adjusts its outerloop E_b/N_t setpoint to achieve and maintain the *Target FER* setting. The range of the outerloop setpoint is bound by the minimum and maximum setpoint settings.

Remote Control

```
CONFigure:RXQuality:FPControl:CONTrol:FCH:TFER
<Target FER>
```

Setpoints

Setpoints define the outer loop E_b/N_t setpoints of the forward fundamental channel.

Minimum

Minimum sets the lower level that the mobile station is allowed to move the E_b/N_t setpoint. If the static value is used, the setting can be adjusted between 0 to the current Maximum level. If the dynamic value is used, the minimum level is automatically set to the current mobile station's setpoint.

Note: *Setting the Minimum and Maximum setpoint to the same values freezes the setpoint to that value, not allowing the mobile to adjust the level. Setting both the Minimum and Maximum levels to Dynamic also freezes the setpoint.*

Remote Control

```
CONFigure:RXQuality:FPControl:CONTrol:FCH:LSPoint:STTic:LOWer
CONFigure:RXQuality:FPControl:CONTrol:FCH:LSPoint:DYNamic:LOWer
```

Maximum

Maximum sets the upper level that the mobile station is allowed to move the E_b/N_t setpoint. If the static value is used, the setting can be adjusted between 31.750 to the current Minimum level. If the dynamic value is used, the maximum level is automatically set to the current mobile station's setpoint.

Note: *Setting the Minimum and Maximum setpoint to the same values freezes the setpoint to that value, not allowing the mobile to adjust the level. Setting both the Minimum and Maximum levels to Dynamic also freezes the setpoint.*

Remote Control

```
CONFigure:RXQuality:FPControl:CONTrol:FCH:LSPoint:STTic:UPPer
CONFigure:RXQuality:FPControl:CONTrol:FCH:LSPoint:DYNamic:UPPer
```

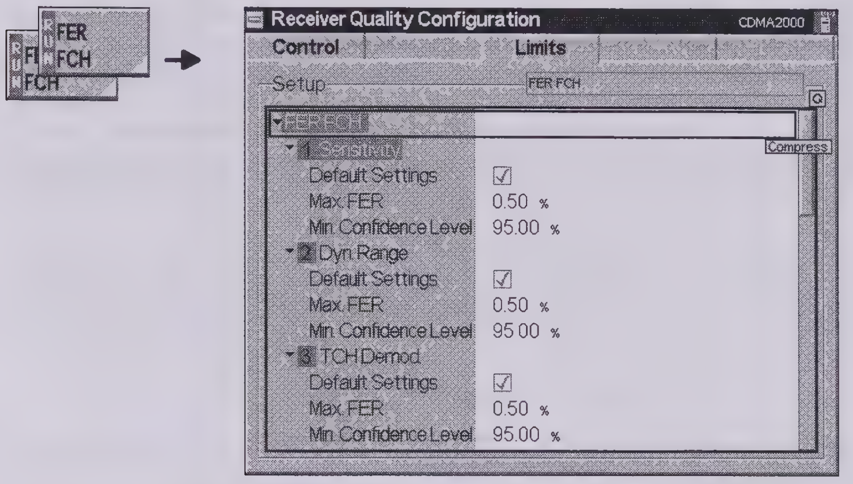
DCCH Control The Dedicated Control Channel is not monitored by the CMU in this release.

SCH0 Control The Supplemental Channel 0 settings and controls are identical to those described for the *FCH Control* above.

SCH1 Control The Supplemental Channel 1 is not monitored by the CMU in this release.

Receiver Quality Configuration – Limits

The *Limits* tab defines tolerance limits for the maximum frame error allowed and the confidence level of the error rate



Setup FER FCH

FER FCH
- 1 Sensitivity
  - Default Settings ☑
  - Max FER 0.50 %
  - Min Confidence Level 95.00 %
- 2 Dyn Range
  - Default Settings ☑
  - Max FER 0.50 %
  - Min Confidence Level 95.00 %
- 3 TCH Demod
  - Default Settings ☑
  - Max FER 0.50 %
  - Min Confidence Level 95.00 %

Figure 4-54 Receiver Quality Configuration – Limits

Max FER The *Max FER* sets the maximum frame error rate allowed before indicating an error.

Remote Control `CONFigure:RXQuality:FER:FCH:LIMit:TSETup<nr>:MFER` *`<Max FER Limit>`*

Min Confidence Level The *Min Confidence Level* sets the minimum confidence level of the error rate that must be met without indicating an error.

Remote Control `CONFigure:RXQuality:FER:FCH:LIMit:TSETup<nr>:CLEVel` *`<Min Confidence Level>`*

Connection Control Menu

The menu group *Connection Control* controls the signalling procedures (call setup and release, services, signalling parameters) and determines the inputs and outputs with the external attenuation values and the reference frequency.

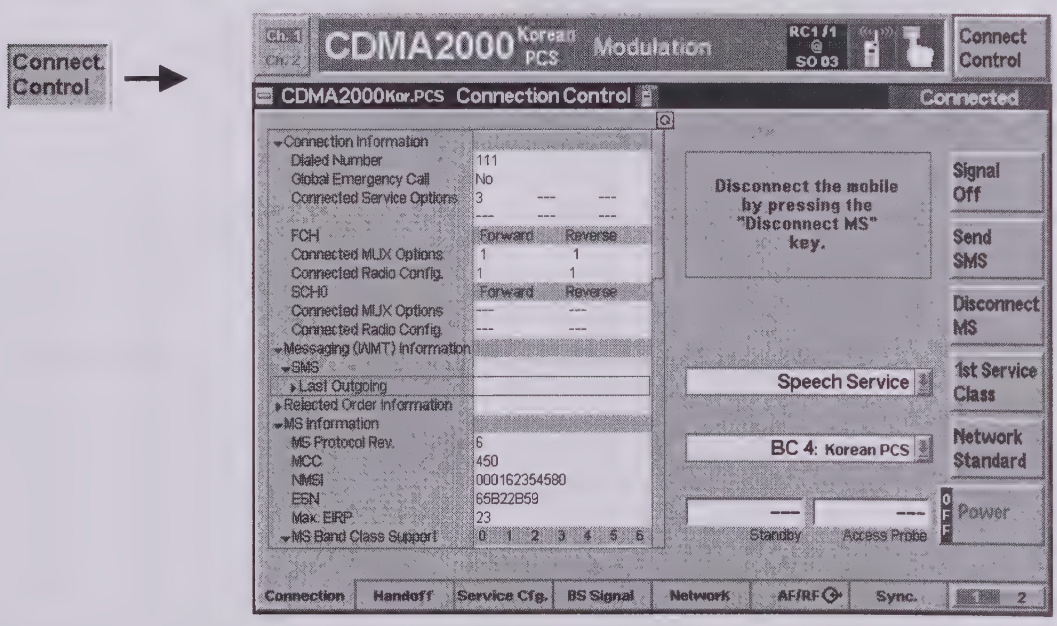
Since the measurements in signalling mode require an existing connection to a mobile station, the menus for setting up the call (*Connection Control - Connection*) appear immediately after selecting a signalling mode (unless the auto popup is disabled). The connection control menus can be accessed any time by pressing the *Connect Control* softkey at the top right corner in every measurement menu. The hotkey bar (at the bottom the screen) links the measurement menus together. Pressing the *Escape* key or the *Connect Control* softkey closes the connection control menu and the CMU changes to the measurement mode.

The tab *Connection Control - Connection* displayed during registration is described in section *Connection Control (Registered State)* beginning on page 4.40. The remaining tabs of the *Connection Control* menu are described here.

Connection Control with Connection Established (Connection Control – Connected)

In its left half the *Connection (Connected)* tab displays a list of signalling parameters describing the capabilities of the UE. The right half contains, in addition to the *1st Service Class* and *Network Standard* softkeys, and the standby and access probe power measurement described in section *Connection Control (Signal Off State)* on p. 4.36 ff., the following softkeys which lead to other services or signalling states (see *Figure 4-17* on p. 4.35):

- Deactivating the CMU's CDMA signal *(Signal Off)*
- *Disconnect MS* while keeping the CDMA signal *(BS Signal)* switched on (–> *Registered)*



Connection Information
Dialed Number 111
Global Emergency Call No
Connected Service Options 3 --- --- / --- --- ---
FCH Forward Reverse
Connected MUX Options 1 1
Connected Radio Config. 1 1
SCH0 Forward Reverse
Connected MUX Options --- ---
Connected Radio Config. --- ---
Messaging (IAMT) Information
SMS
Last Outgoing
Rejected Order Information
MS Information
MS Protocol Rev. 6
MCC 450
NMSI 000162354580
ESN 65B22B59
Max. EIRP 23
MS Band Class Support 0 1 2 3 4 5 6

Disconnect the mobile by pressing the "Disconnect MS" key.

Speech Service

BC 4: Korean PCS

Standby --- Access Probe ---

Figure 4-55 Connection Control – Connection (Connected)

The function of the *Signal Off* softkey is described in section *Connection Control (Signal On State)* on p. 4.38 ff., the *Disconnect UE* softkey in section *Connection Control (Alerting State)* on p. 4.42 ff.

Message box A message displayed in each *Connection* tab provides the current instrument state or indicates how to proceed to get to other signalling states. In this instance, the message `Disconnect the mobile by pressing the "Disconnect MS" key` is displayed.

The parameter overview in the left half of the menu is also indicated in the other *Connection* tabs. In the *Connected* signalling state, a maximum of information is available, the table shows the settings that were used to attempt the connection and all information that could be obtained from the mobile at a given time.

Connection Information List of parameters used to attempt the call and current service configuration.

Remote control
`[SENSe:]CINFo...?`

Messaging (WMT) Information List of parameters describing the last short message sent to the MS.

Remote control
`[SENSe:]MINFo:SMS:LOUTgoing...?`

MS Information List of parameters provided by the MS and describing its properties.

Remote control
`[SENSe:]MSSinfo...?`

Signalling Setup Current settings of the System ID, important BS Signal settings, RF connectors and external attenuation settings, and AF connectors.

Remote control

```
CONFigure:NETWork:SYSTem:SID?
CONFigure:BSSignal...?
INPut[:STATe]?
OUTPut[:STATe]?
[SENSe:]CORRection:LOSS...?
ROUTe:SPENcoder[:INPut]?
ROUTe:SPDEcoder[:OUTPut]?
```

Send SMS

The *Send SMS* softkey delivers the current short message to the mobile station. The CMU indicates *Sending Message* and then returns to the *Connected* state. The short message is a text of a maximum of 160 characters that is defined, together with other SMS parameters, in the *Service Cfg.* tab (see section *Messaging Teleservice* on p. 4.122 ff.). The current short message is also displayed in the parameter overview, section *Messaging (WMT) Information.*

In the *Connected* state, an SMS can be sent irrespective of the Primary Service Class, i.e. for all three classes *Loopback Service, Speech Service,* and *Test Data Service;* see *1st Service Class* softkey on p. 4.37.

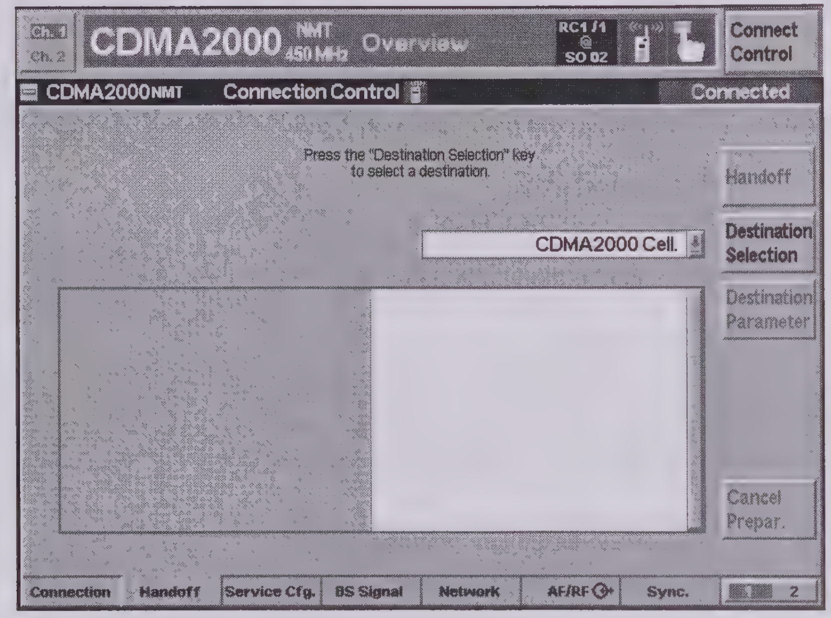
Remote control
`PROCedure:SIGNalling:ACTion SMESsage`

Handoff to Another Network (Connection Control – Handoff)

The *Handoff* tab initiates a handoff of the established call to a different network. Since a call needs to be established, this menu is only available in the *Connected* signalling state. Handoff includes:

- Selection of the target network (*Destination Selection*) and the handoff parameters (*Destination Parameter* and *Destination Defaults*)
- Start of the handoff procedure (*Handoff*)
- Display and modification of the parameters of the original network (*Origin Parameter*)
- Possibly cancel handoff preparations and remain in the original network *(Cancel Prepar.)*

Connect. Control →



Press the "Destination Selection" key to select a destination.

Figure 4-56 Connection Control – Handoff

Message box A message displayed across the top of the *Handoff* tab provides the current instrument state or indicates how to proceed to get to other signalling states. In this instance, the message `Press the "Handoff" key to perform a Handoff from the Origin to the Destination Network` is displayed.

Destination Selection

The *Destination* Selection softkey selects the target network for the handoff. A handoff destination with fallback (e.g. *AMPS Fallback)* causes the CMU to return to the function group of the origin network after the call is released.

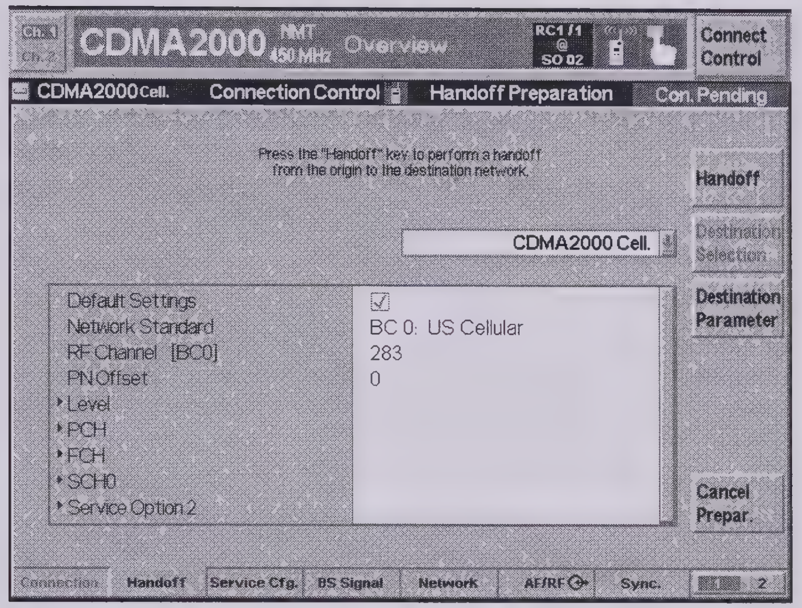
The *Destination Selection* list is automatically adapted to the connected mobile. From the CDMA network, a handoff to the analog (AMPS) network as well as handoffs to other CDMA bands (interband handoff) are supported.

Once the selection is confirmed (pressing the *Enter* key) the menu changes to the *Handoff Preparation* screen. The entire *Connection Control* menu is mapped onto the target function group making it possible to edit the *Destination* parameters, the *BS Signal*, and the *Network* parameters of the target network.

Remote Control

```
STATus:HANDoff:TARGet:LIST?
CONFigure:HANDoff:TARGet
"CDMA2KCellMS" | "CDMA2KPCSMS" | "CDMA2KIMT2KMS" |
"CDMA2K450MS" | "AMPSMS" | "CDMA2KCellMSFallback" |
"CDMA2KPCSMSFallback" | "CDMA2KIMT2KMSFallback" |
"CDMA2K450MSFallback" | "AMPSMSFallback"
```

Connect. Control



Press the "Handoff" key to perform a handoff from the origin to the destination network.

CDMA2000 Cell.

Default Settings	☑
Network Standard	BC 0: US Cellular
RF Channel [BC0]	283
PN Offset	0
▸ Level	
▸ PCH	
▸ FCH	
▸ SCH0	
▸ Service Option 2	

Figure 4-57 Connection Control – Handoff (destination network preparation)

Handoff

The *Handoff* softkey initiates the handoff to the target network. When a handoff is initiated, all measurements are turned off.

Remote control
`PROCedure:SIGNalling:ACTion HANDoff`

Destination Parameter

The *Destination Parameter* softkey sets important network parameters of the target network necessary for the handoff.

The entries depend on the target network selected with the *Destination Selection* softkey. It is possible to restore the default settings for all parameters using the *Default Settings* switch.

Remote control
The destination parameters must be set in the destination network function group.

Cancel Prepar.

The *Cancel Prepar.* softkey cancels the *Handoff* procedure and resets the CMU to the *Connected* signalling state.

The destination parameters defined in the *Call Pending* state are maintained. To drop the *Handover* procedure and return to the measurement mode, press the *ESCAPE* key or the *Connection Control* softkey.

Remote control
–

Service Configuration of the CMU (Connection Control – Service Cfg.)

The popup menu *Service Cfg.* configures the service options available for the five Primary Service Classes *Loopback Service*, *Speech Service, Test Data Service, Packet Data Service* and *Wireless Messaging Teleservice (WMT).*

The descriptions of the *Service Configuration* tab is divided into several sections, corresponding to the different Primary Service Classes.

Note: ***Service Negotiation***

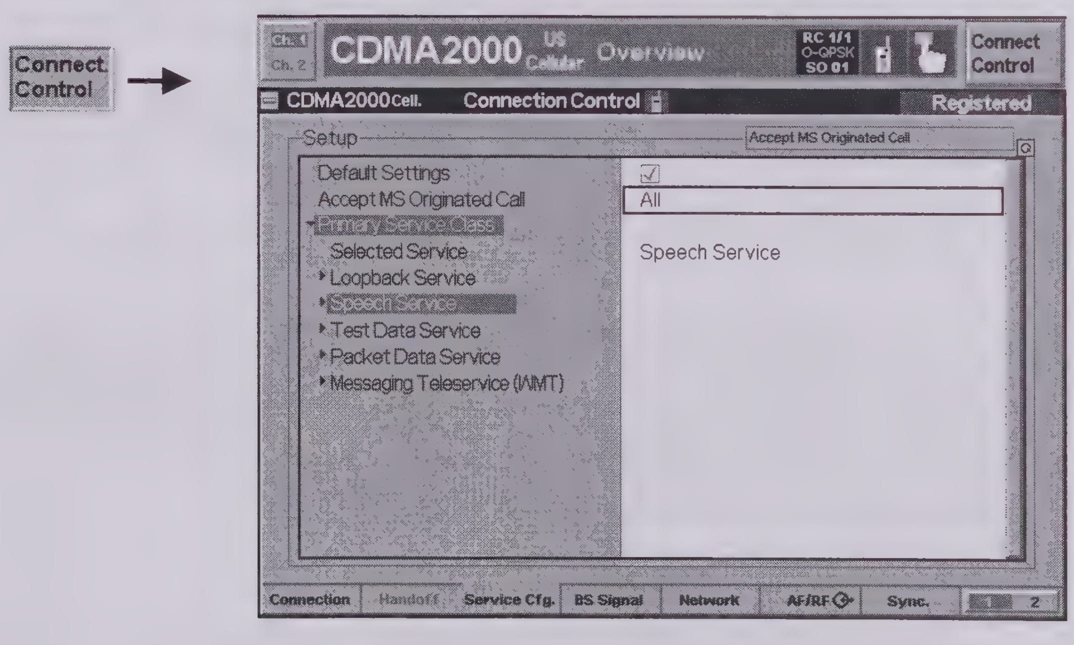
The Service Option can be changed while a connection is established (signalling state Connected). If an attempt is made to select a Service Option that is not supported by the mobile, then the mobile may suggest another (supported) option. The CMU will accept and activate the suggested option, if possible.

Note: ***MOC with service option***

When attempting a call to the base station/CMU (MOC), the mobile station can request a particular service option and service configuration. The CMU can be set to accept all calls or only calls requesting a particular service option; see Accept MS Originated Call *below.*

General Settings

The *Service Cfg.* tab provides parameters to select the *Primary Service Class* and select the calls from the mobile that the CMU will accept.



Default Settings ☑

Accept MS Originated Call: All

Primary Service Class

Selected Service: Speech Service

- Loopback Service
- Speech Service
- Test Data Service
- Packet Data Service
- Messaging Teleservice (WMT)

Figure 4-58 Connection Control – Service Configuration (General)

The service selection *(Selected Service)* is equivalent to the *1st Service Class* softkey in the *Connection* tab described on p. 4.37. The *Primary Service Class* currently selected is highlighted along with the selected Service Option.

Accept MS Originated Call

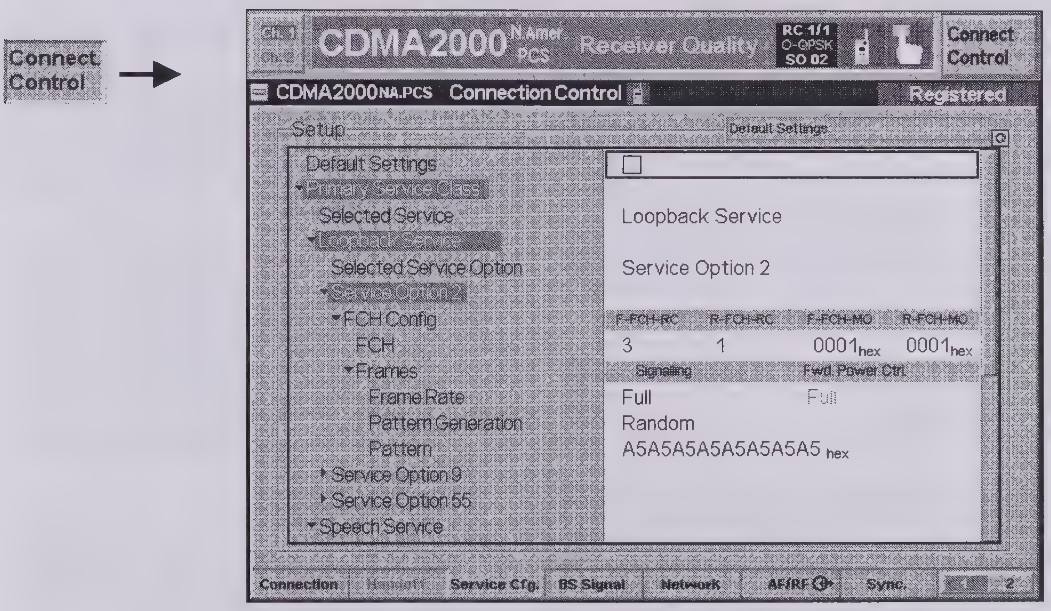
Selects the types of Mobile Station Originated Calls (MOC) that the CMU will accept:

All	Accept all MOCs, irrespective of the requested service option. The requested service option is activated at the CMU.
Selected Primary Service Only	Accept only MOCs requesting the service option currently selected.

Remote control
`CONFigure:SCONfig:AMOC ALL | SCL1`

Loopback Service

Three different service options can be selected and configured for *Loopback Service.*



Default Settings ☐
Primary Service Class
Selected Service: Loopback Service
Loopback Service
Selected Service Option: Service Option 2
Service Option 2
FCH Config
FCH: F-FCH-RC 3, R-FCH-RC 1, F-FCH-MO 0001hex, R-FCH-MO 0001hex
Frames: Signaling, Fwd. Power Ctrl.
Frame Rate: Full, Full
Pattern Generation: Random
Pattern: A5A5A5A5A5A5A5A5 hex
Service Option 9
Service Option 55
Speech Service

Figure 4-59 Connection Control – Service Configuration (Loopback Service)

Default Settings

The *Default Settings* switch assigns default values to all settings in the *Service Cfg.* tab (the default values are quoted in the command description in chapter 6 of this manual).

Remote control
`DEFault:SCONfig ON | OFF`

Selected Service Option

This displays and changes the service option selected for the loopback service. The CMU supports Service Options 2, 9, and 55. All service options meet the requirements described in standard TIA/EIA-126-D.

Remote control
```
CONFigure:SCONfig:SCLass<nr>:LOOP:SOPTion
PROCedure:SCONfig:SCLass<nr>:LOOP:SOPTion
S02D | S09D | S55D
```

Service Option 2 / Service Option 9

Service Option 2 and *Service Option 9* apply to systems with Protocol Revision (P_REV) equal to 5 or lower. They provide a loopback of primary traffic information bits through the mobile station using the Forward Fundamental Code Channel with Multiplex Option 1 and 2, respectively. The FCH can be configured as follows:

FCH	sets the Radio Configuration to use for the Forward and Reverse Fundamental Channel (*F-FCH-RC* and *R-FCH-RC*). The Multiplex Options (*F-FCH-MO* and *R-FCH-MO*) are not selectable; they are set to 1 by the Service Option 2 selection and to 2 by the Service Option 9 selection. Refer to *Connected Service Option Configuration* on page 4.125 about changing Radio Configurations in the Connected signalling state.
Note:	*TX measurements depend on the Reverse Radio Configuration (R-RC) of the mobile station. In general O-QPSK measurements require a R-RC 1 or 2, whereas H-PSK measurements require a R-RC 3 or 4. For an overview see Table 4-4 on p. 4.34 ff.*
Frame Rate	*Frame Rate* sets the frame rate of the F-FCH to Full, Half, Quarter, or Eighth.
Pattern Generation	sets the type of pattern the base station generates and sends to the mobile station. RANDOM sends a random pattern to the mobile station and is the preferred method to obtain the best measurement performance. FIXED sends the bit pattern defined in the *Pattern* field. The base station generates one fundamental data block to the mobile station. After a delay to allow for processing, the mobile station sends one reverse fundamental data block back to the base station. The base station can set the bits within a data block to a random pattern or any desired value (fixed).
Pattern	defines the bit pattern that the pattern generator uses to send to the mobile station for measurements. This pattern is used if *Pattern Generation* is set to *FIXED*.

Service Option 55

Service Option 55 applies to systems with Protocol Revision (P_REV) equal to 6 or higher. The option provides a loopback of primary traffic information bits through the mobile station; the Multiplex Option can be either 1 or 2. The FCH can be configured as follows:

FCH	sets the Radio Configuration to use for the Forward and Reverse Fundamental Channel (*F-FCH-RC* and *R-FCH-RC*). The Multiplex Options (*F-FCH-MO* and *R-FCH-MO*) are either 1 or 2 but equal for the forward and reverse channel. The range of possible radio configurations depends on the multiplex option; see *Table 4-7 below*. Refer to *Connected Service Option Configuration* on page 4.125 about changing Radio Configurations in the Connected signalling state.

The *Frame Rate* and *Pattern* settings are the same as described under Service Option 2.

Note:	*TX measurements depend on the Reverse Radio Configuration (R-RC) of the mobile station. In general O-QPSK measurements require a R-RC 1 or 2, whereas H-PSK measurements require a R-RC 3 or 4. For an overview see Table 4-4 on p. 4.34 ff.*

Table 4-7 Multiplex options and radio configurations for Service Option 55

Multiplex option in use	F-FCH-RC	R-FCH-RC
1	1, 3, 4	1, 3
2	2, 5	2, 4

Remote control

```
CONFigure:SCONfig:SCLass<nr>:LOOP:S<opt_no>D:FCH:RC
PROCedure:SCONfig:SCLass<nr>:LOOP:S<opt_no>D:FCH:RC
<F_RC>, <R_RC>
CONFigure:SCONfig:SCLass<nr>:LOOP:S<opt_no>D:FCH:FRAT
PROCedure:SCONfig:SCLass<nr>:LOOP:S<opt_no>D:FCH:FRAT
EIGHth | QUARter | HALF | FULL | DEFault

CONFigure:SCONfig:SCLass<nr>:LOOP:S<opt_no>:FCH:PGEN
PROCedure:SCONfig:SCLass<nr>:LOOP:S<opt_no>:FCH:PGEN
RANDom | FIXed | DEFault
CONFigure:SCONfig:SCLass<nr>:LOOP:S<opt_no>D:FCH:PATTern
PROCedure:SCONfig:SCLass<nr>:LOOP:S<opt_no>D:FCH:PATTern
<Pattern>
```

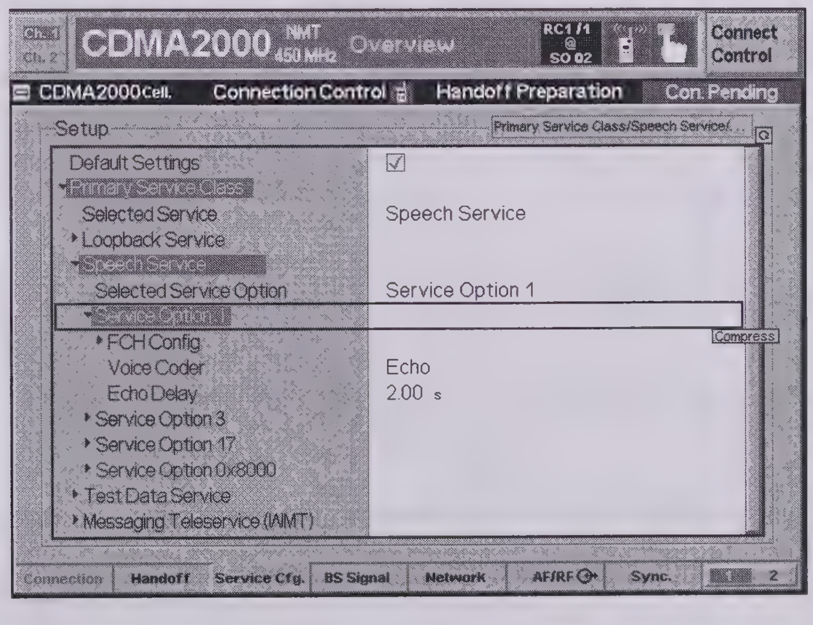
where <opt_no> denotes the 2-digit number of the service option (02, 09 or 66).
In addition:

```
CONFigure:SCONfig:SCLass<1>:LOOP:S55D:FCH:FORWard:MO?
CONFigure:SCONfig:SCLass<1>:LOOP:S55D:FCH:REVerse:MO?
```

Speech Service

Four different service options can be selected and configured for *Speech Service*.

Connect Control →



Default Settings ☑
Primary Service Class
Selected Service: Speech Service
Loopback Service
Speech Service
Selected Service Option: Service Option 1
Service Option 1
FCH Config
Voice Coder: Echo
Echo Delay: 2.00 s
Service Option 3
Service Option 17
Service Option 0x8000
Test Data Service
Messaging Teleservice (WMT)

Figure 4-60 Connection Control – Service Configuration (Speech Service)

Selected Service Option

This displays and changes the service option selected for the speech service. The CMU supports Service Options 1, 3, 17, and 0x8000.

Remote control

```
CONFigure:SCONfig:SCLass<nr>:SPEech:SOPTion
PROCedure:SCONfig:SCLass<nr>:SPEech:SOPTion
S01D | S03D | S17D | SX8T
```

Service Option 1

Service Option 1 provides a variable rate, two-way speech service to the mobile station using the Forward Fundamental Code Channel with Multiplex Option 1. Service Option 1 meets the requirements described in standard TIA/EIA-96-C.

FCH Config

FCH

FCH sets the Radio Configuration to use for the Forward and Reverse Fundamental Channel (*F-FCH-RC* and *R-FCH-RC*).

The Multiplex Options (*F-FCH-MO* and *R-FCH-MO*) are not selectable; they are set to 1 by the Service Option 1 selection.

Refer to *Connected Service Option Configuration* on page 4.125 about changing Radio Configurations in the Connected signalling state.

Note: *TX measurements depend on the Reverse Radio Configuration (R-RC) of the mobile station. In general O-QPSK measurements require a R-RC 1 or 2, whereas H-PSK measurements require a R-RC 3 or 4. For an overview see Table 4-4 on p. 4.34 ff.*

Remote Control

```
CONFigure:SCONfig:SCLass<nr>:SPEech:S01D:FCH:RC
PROCedure:SCONfig:SCLass<nr>:SPEech:S01D:FCH:RC
<F_RC>, <R_RC>
```

Voice Coder

Voice Coder configures how the CMU returns the data transmitted over the traffic channel to the mobile for service option 1.

Echo	Loop-back with delay. The CMU sends back all data received on the TCH after the specified *Echo Delay* (see below) without invoking the speech codec.
8k	The CMU sends and receives speech data via the RF signal that are routed to the 8 kbps speech coder (option CMU-B83). Analog signals are provided at the *SPEECH* connector at the front panel of the instrument. The analog input signal at *SPEECH* is amplified by +22.5 dB. The signal flow is shown in *Figure 4-71* on p. 4.148.
8k (Low)	Same as *8k*, however, the analog input signal is not amplified.
Decoder Cal.	The speech codec (option CMU-B83) provides a 1 kHz sinewave signal at its analog output. This signal is used for external calibration of the analog output paths.
Encoder Cal.	The speech codec (option CMU-B83) loops the input signal after digital/analog conversion directly to the analog output. This signal is used for external calibration of the analog input paths.
Codec Cal.	The CMU sends and receives speech frames that are routed to the internal speech codec (option CMU-B83). Analog signals are provided via the SPEECH connector at the front panel of the instrument. The analog input signal at connector SPEECH is not amplified. The CMU sends a close loop message to the mobile station to activate an internal test loop.

Remote

```
CONFigure:SCONfig:SCLass<nr>:SPEech:S01D:VCODer
```

Control `ECHO | V8 | V8Low | CCAL | ECAL | DCAL | DEF`

Echo Delay

Echo Delay defines the time that the CMU waits before it loops back the received data if the *Voice Coder* is set to *Echo* mode. The setting has no effect for the other *Voice Coder* settings.

Remote Control
`CONFigure:SCONfig:SCLass<nr>:SPEech:S01D:EDELay`
`<Delay>`

Service Option 3

Service Option 3 provides an enhanced variable rate, two-way speech service to the mobile station using the Forward Fundamental Code Channel with Multiplex Option 1. Service Option 3 meets the requirements described in standard TIA/EIA/IS-127.

FCH Config
FCH

FCH sets the Radio Configuration to use for the Forward and Reverse Fundamental Channel (*F-FCH-RC* and *R-FCH-RC*).

The Multiplex Options (*F-FCH-MO* and *R-FCH-MO*) are not selectable; they are set to 1 by the Service Option 3 selection.

Refer to *Connected Service Option Configuration* on page 4.125 about changing Radio Configurations in the Connected signalling state.

Note: *TX measurements depend on the Reverse Radio Configuration (R-RC) of the mobile station. In general O-QPSK measurements require a R-RC 1 or 2, whereas H-PSK measurements require a R-RC 3 or 4. For an overview see Table 4-4 on p. 4.34 ff.*

Remote Control
`CONFigure:SCONfig:SCLass<nr>:SPEech:S03D:FCH:RC`
`PROCedure:SCONfig:SCLass<nr>:SPEech:S03D:FCH:RC`
`<F_RC>, <R_RC>`

Voice Coder

Voice Coder configures how the CMU returns the data transmitted over the traffic channel to the mobile for service option 3. A *8k Enhanced* speech coder is available for service option 3. Besides all settings are analogous to service option 1; see above.

Remote Control
`CONFigure:SCONfig:SCLass<nr>:SPEech:S03D:VCODer`
`ECHO | V8E | V8ELow | CCAL | ECAL | DCAL | DEF`

Echo Delay

Echo Delay defines the time that the CMU waits before it loops back the received data if the *Voice Coder* is set to *Echo* mode. The setting has no effect for the other *Voice Coder* settings.

Remote Control
`CONFigure:SCONfig:SCLass<nr>:SPEech:S03D:EDELay`
`<Delay>`

Service Option 17

Service Option 17 provides an enhanced variable rate, two-way speech service to the mobile station using the Forward Fundamental Code Channel with Multiplex Option 1. Service Option 17 meets the requirements described in standard TIA/EIA/IS-733.

FCH Config

FCH

FCH sets the Radio Configuration to use for the Forward and Reverse Fundamental Channel (*F-FCH-RC* and *R-FCH-RC*).

The Multiplex Options (*F-FCH-MO* and *R-FCH-MO*) are not selectable; they are set to 2 by the Service Option 17 selection.

Refer to *Connected Service Option Configuration* on page 4.125 about changing Radio Configurations in the Connected signalling state.

Remote Control

```
CONFigure:SCONfig:SCLass<nr>:SPEech:S17D:FCH:RC
PROCedure:SCONfig:SCLass<nr>:SPEech:S17D:FCH:RC
<F_RC>, <R_RC>
```

Voice Coder

Voice Coder configures how the CMU returns the data transmitted over the traffic channel to the mobile for service option 3. A *13k* speech coder is available for service option 17. Besides all settings are analogous to service option 1; see above.

Remote Control

```
CONFigure:SCONfig:SCLass<nr>:SPEech:S17D:VCODer
ECHO | V13 | V13Low | CCAL | ECAL | DCAL | DEF
```

Echo Delay

Echo Delay defines the time that the CMU waits before it loops back the received data if the *Voice Coder* is set to *Echo* mode. The setting has no effect for the other *Voice Coder* settings.

Remote Control

```
CONFigure:SCONfig:SCLass<nr>:SPEech:S17D:EDELay
<Delay>
```

Service Option 0x8000

Service Option 0x8000 provides an enhanced variable rate, two-way speech service to the mobile station using the Forward Fundamental Code Channel with Multiplex Option 1. Service Option 0x8000 meets the requirements described in standard CDG RF 27.

FCH Config

FCH

FCH sets the Radio Configuration to use for the Forward and Reverse Fundamental Channel (*F-FCH-RC* and *R-FCH-RC*).

The Multiplex Options (*F-FCH-MO* and *R-FCH-MO*) are not selectable; they are set to 2 by the Service Option 0x8000 selection.

Refer to *Connected Service Option Configuration* on page 4.125 about changing Radio Configurations in the Connected signalling state.

Note: *TX measurements depend on the Reverse Radio Configuration (R-RC) of the mobile station. In general O-QPSK measurements require a R-RC 1 or 2, whereas H-PSK measurements require a R-RC 3 or 4. For an overview see Table 4-4 on p. 4.34 ff.*

Remote Control

```
CONFigure:SCONfig:SCLass<nr>:SPEech:SX8T:FCH:RC
PROCedure:SCONfig:SCLass<nr>:SPEech:SX8T:FCH:RC
<F_RC>, <R_RC>
```

Voice Coder

Voice Coder is not available for service option 0x8000. The CMU always operates in Loop back mode *(Echo)* with the specified *Echo Delay* (see below).

Echo Delay

Echo Delay defines the time that the CMU waits before it loops back the received data.

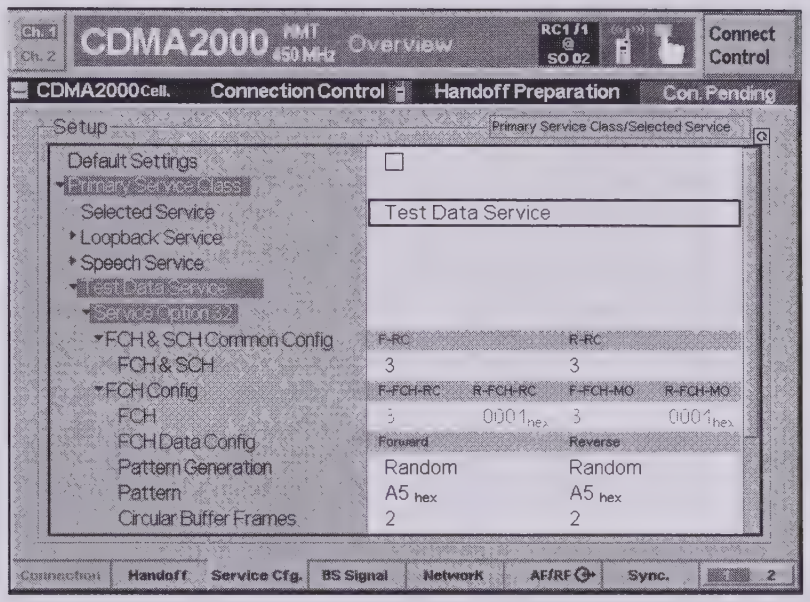
Remote Control

```
CONFigure:SCONfig:SCLass<nr>:SPEech:SX8T:EDELay
<Delay>
```

Test Data Service

Service option 32 can be configured for *Test Data Service.*

Connect. Control →



Default Settings ☐
Primary Service Class
Selected Service: Test Data Service
Loopback Service
Speech Service
Test Data Service
Service Option 32
FCH & SCH Common Config

	F-RC	R-RC		
FCH & SCH	3	3		
FCH Config	**F-FCH-RC**	**R-FCH-RC**	**F-FCH-MO**	**R-FCH-MO**
FCH	3	0001 hex	3	0001 hex
FCH Data Config	**Forward**		**Reverse**	
Pattern Generation	Random		Random	
Pattern	A5 hex		A5 hex	
Circular Buffer Frames	2		2	

Figure 4-61 Connection Control – Service Configuration (Test Data Service)

Selected Service Option	This displays and changes the service option selected for the Test Data Service. The CMU supports Service Option 32.

Remote control
`CONFigure:SCONfig:SCLass<nr>:SPEech:SOPTion`
`PROCedure:SCONfig:SCLass<nr>:SPEech:SOPTion`
`S01D | S03D | S17D | SX8T`

Service Option 32

Service Option 32 allows verification of the physical layer performance frame error rate (FER) and PDU error rate (PER) of CDMA2000 physical channels. Service Option 32 meets the requirements described in standard TIA/EIA/IS-858 TDSO.

FCH & SCH Common Config

FCH & SCH

FCH & SCH sets the Radio Configuration to use for the Forward and Reverse Fundamental Channel and Supplemental Channel (*F-FCH-RC* and *R-FCH-RC*).

The settings made here automatically set the forward and reverse radio configurations and multiplex options for both the Fundamental channel (FCH) and Supplemental channel (SCH).

Refer to the section *Supplemental Channel Configuration and Dependencies for TDSO* on page 4.119 for more information about Supplemental Channel configurations.

Refer to *Connected Service Option Configuration* on page 4.125 about changing Radio Configurations in the Connected signalling state.

Note: *TX measurements depend on the Reverse Radio Configuration (R-RC) of the mobile station. In general O-QPSK measurements require a R-RC 1 or 2, whereas H-PSK measurements require a R-RC 3 or 4. For an overview see Table 4-4 on p. 4.34 ff.*

Remote Control

```
CONFigure:SCONfig:SCLass<nr>:TDAT:S32D:FSCommon:RC
PROCedure:SCONfig:SCLass<nr>:TDAT:S32D:FSCommon:RC
<F_RC>, <R_RC>
```

Fundamental Channel: FCH Config

FCH

FCH displays the Radio Configuration and Multiplex Option for the Forward and Reverse Fundamental Channel (*F-FCH-RC* and *R-FCH-RC*, *F-FCH-MO* and *R-FCH-MO*).

These are defined by the FCH & SCH Common Config. settings.

Remote Control

```
CONFigure:SCONfig:SCLass<nr>:TDAT:S32D:FCH:RC
PROCedure:SCONfig:SCLass<nr>:TDAT:S32D:FCH:RC
<F_RC>, <R_RC>
```

FCH Data Config

Pattern Generation

Pattern Generation sets the type of pattern the base station generates and sends to the mobile station. *RANDOM* sends a random pattern to the mobile station and is the preferred method to obtain the best measurement performance. *FIXED* sends the bit pattern defined in the *Pattern* field.

The base station generates one fundamental data block to the mobile station. After a delay to allow for processing, the mobile station sends one reverse fundamental data block back to the base station. The base station can set the bits within a data block to a random pattern or any desired value (fixed).

Remote Control

```
CONFigure:SCONfig:SCLass<nr>:TDAT:S32D:FCH:FORWard:PGEN
PROCedure:SCONfig:SCLass<nr>:TDAT:S32D:FCH:FORWard:PGEN
CONFigure:SCONfig:SCLass<nr>:TDAT:S32D:FCH:REVerse:PGEN
PROCedure:SCONfig:SCLass<nr>:TDAT:S32D:FCH:REVerse:PGEN
RANDom | FIXed
```

Pattern

Pattern defines the bit pattern that the pattern generator uses to send to the mobile station for measurements. This pattern is used if *Pattern Generation* is set to *FIXED*.

Remote Control

```
CONFigure:SCONfig:SCLass<nr>:TDAT:S32D:FCH:FORWard:PATTern
PROCedure:SCONfig:SCLass<nr>:TDAT:S32D:FCH:FORWard:PATTern
CONFigure:SCONfig:SCLass<nr>:TDAT:S32D:FCH:REVerse:PATTern
PROCedure:SCONfig:SCLass<nr>:TDAT:S32D:FCH:REVerse:PATTern
<Pattern>
```

Circular Buffer Frames

Circular Buffer Frames sets the number of frames to use in the circular buffer of the fundamental channel when the random pattern is selected.

Remote Control

```
CONFigure:SCONfig:SCLass<nr>:TDAT:S32D:FCH:FORWard:CBFRames
PROCedure:SCONfig:SCLass<nr>:TDAT:S32D:FCH:FORWard:CBFRames
CONFigure:SCONfig:SCLass<nr>:TDAT:S32D:FCH:REVerse:CBFRames
PROCedure:SCONfig:SCLass<nr>:TDAT:S32D:FCH:REVerse:CBFRames
<Circular Buffer Frames>
```

Tx On Period

Tx On Period sets the transmission on period in frames of the forward and reverse fundamental channel when the frame activity is deterministic.

Remote Control

```
CONFigure:SCONfig:SCLass<nr>:TDAT:S32D:FCH:FORWard:TXON
PROCedure:SCONfig:SCLass<nr>:TDAT:S32D:FCH:FORWard:TXON
CONFigure:SCONfig:SCLass<nr>:TDAT:S32D:FCH:REVerse:TXON
PROCedure:SCONfig:SCLass<nr>:TDAT:S32D:FCH:REVerse:TXON
<Transmit On Period>
```

Tx Off Period

Tx Off Period sets the transmission off period in frames of the forward and reverse fundamental channel when the frame activity is deterministic.

Remote Control

```
CONFigure:SCONfig:SCLass<nr>:TDAT:S32D:FCH:FORWard:TXOFf
PROCedure:SCONfig:SCLass<nr>:TDAT:S32D:FCH:FORWard:TXOFf
CONFigure:SCONfig:SCLass<nr>:TDAT:S32D:FCH:REVerse:TXOFf
PROCedure:SCONfig:SCLass<nr>:TDAT:S32D:FCH:REVerse:TXOFf
<Transmit Off Period>
```

Supplemental Channels: SCH0 and SCH1

Configuration of the two supplemental channels SCH0 and SCH1 is analogous. In the remote control commands, the keywords `:ZERO` and `:ONE` are used to denote the SCH type.

SCH0/1 Enable

SCH0/1 Enable disables or enables the forward and reverse supplemental channel 0/1.

Remote Control

```
CONFigure:SCONfig:SCLass<nr>:TDAT:S32D:SCH:<TYPE>:FORWard:ENABle
PROCedure:SCONfig:SCLass<nr>:TDAT:S32D:SCH:<TYPE>:FORWard:ENABle
CONFigure:SCONfig:SCLass<nr>:TDAT:S32D:SCH:<TYPE>:REVerse:ENABle
PROCedure:SCONfig:SCLass<nr>:TDAT:S32D:SCH:<TYPE>:REVerse:ENABle
ON | OFF   (<TYPE> = ZERO | ONE)
```

SCH0/1 Config

SCH0/1

SCH0/1 displays the Radio Configuration and Multiplex Option for the forward and reverse supplemental channels (*F-SCH0/1-RC* and *R-SCH0/1-MO*).

These are defined by the FCH & SCH Common Config. settings.

SCH0/1 Data Config

Coding

Coding selects the channel encoder for the forward and reverse supplemental channels.

Convolutional	Use convolutional encoding. This setting is available for all data rates.
Turbo	Use turbo encoding. This setting is available for high data rates ≥ 19.2 kbps, i.e. for all combinations of *MuxPDUs / Layer* and *Frame Types* except *MuxPDUs / Layer = 1, Frame Types = 1* (see *Table 4-9* on p. 4.124).
Convolutional (Turbo if possible)	Indicates that convolutional coding is used because turbo coding is not supported for the selected data rate of beyond 9.6 kbps *(MuxPDUs / Layer = 1, Frame Types = 1).* Turbo coding will be set as soon as the data rate is increased beyond 9.6 kbps.

Remote Control

```
CONFigure:SCONfig:SCLass<nr>:PDAT:S32D:SCH:<TYPE>:FORWard:CODing
CONFigure:SCONfig:SCLass<nr>:PDAT:S32D:SCH:<TYPE>:REVerse:CODing
      CONV | CTIP | TURBo      (<TYPE> = ZERO | ONE)
```

Pattern Generation

Pattern Generation sets the type of pattern the base station generates and sends to the mobile station. *RANDOM* sends a random pattern to the mobile station and is the preferred method to obtain the best measurement performance. *FIXED* sends the bit pattern defined in the *Pattern* field.

The base station generates one fundamental data block to the mobile station. After a delay to allow for processing, the mobile station sends one reverse fundamental data block back to the base station. The base station can set the bits within a data block to a random pattern or any desired value (fixed).

Remote Control

```
CONFigure:SCONfig:SCLass<nr>:TDAT:S32D:SCH:<TYPE>:FORWard:PGEN
PROCedure:SCONfig:SCLass<nr>:TDAT:S32D:SCH:<TYPE>:FORWard:PGEN
CONFigure:SCONfig:SCLass<nr>:TDAT:S32D:SCH:<TYPE>:REVerse:PGEN
PROCedure:SCONfig:SCLass<nr>:TDAT:S32D:SCH:<TYPE>:REVerse:PGEN
<Pattern Generation>    (<TYPE> = ZERO | ONE)
```

Pattern

Pattern defines the bit pattern that the pattern generator uses to send to the mobile station for measurements. This pattern is used if *Pattern Generation* is set to *FIXED*.

Remote Control

```
CONFigure:SCONfig:SCLass<nr>:TDAT:S32D:SCH:<TYPE>:FORWard:PATTern
PROCedure:SCONfig:SCLass<nr>:TDAT:S32D:SCH:<TYPE>:FORWard:PATTern
CONFigure:SCONfig:SCLass<nr>:TDAT:S32D:SCH:<TYPE>:REVerse:PATTern
PROCedure:SCONfig:SCLass<nr>:TDAT:S32D:SCH:<TYPE>:REVerse:PATTern
<Pattern>   (<TYPE> = ZERO | ONE)
```

Circular Buffer Frames

Circular Buffer Frames sets the number of frames to use in the circular buffer of the forward and reverse supplemental channel 0/1 when the random pattern is selected.

Remote Control

```
CONFigure:SCONfig:SCLass<nr>:TDAT:S32D:SCH:<TYPE>:FORWard:CBFRames
PROCedure:SCONfig:SCLass<nr>:TDAT:S32D:SCH:<TYPE>:FORWard:CBFRames
CONFigure:SCONfig:SCLass<nr>:TDAT:S32D:SCH:<TYPE>:REVerse:CBFRames
PROCedure:SCONfig:SCLass<nr>:TDAT:S32D:SCH:<TYPE>:REVerse:CBFRames
<Circular Buffer Frames>    (<TYPE> = ZERO | ONE)
```

Tx On Period *Tx On Period* sets the transmission on period in frames of the forward and reverse supplemental channel 0/1 when the frame activity is deterministic.

Remote Control

```
CONFigure:SCONfig:SCLass<nr>:TDAT:S32D:SCH:<TYPE>:FORWard:TXON
PROCedure:SCONfig:SCLass<nr>:TDAT:S32D:SCH:<TYPE>:FORWard:TXON
CONFigure:SCONfig:SCLass<nr>:TDAT:S32D:SCH:<TYPE>:REVerse:TXON
PROCedure:SCONfig:SCLass<nr>:TDAT:S32D:SCH:<TYPE>:REVerse:TXON
<Transmit On Period>     (<TYPE> = ZERO | ONE)
```

Tx Off Period *Tx Off Period* sets the transmission off period in frames of the forward and reverse supplemental channel 0/1 when the frame activity is deterministic.

Remote Control

```
CONFigure:SCONfig:SCLass<nr>:TDAT:S32D:SCH:<TYPE>:FORWard:TXOFf
PROCedure:SCONfig:SCLass<nr>:TDAT:S32D:SCH:<TYPE>:FORWard:TXOFf
CONFigure:SCONfig:SCLass<nr>:TDAT:S32D:SCH:<TYPE>:REVerse:TXOFf
PROCedure:SCONfig:SCLass<nr>:TDAT:S32D:SCH:<TYPE>:REVerse:TXOFf
<Transmit Off Period>     (<TYPE> = ZERO | ONE)
```

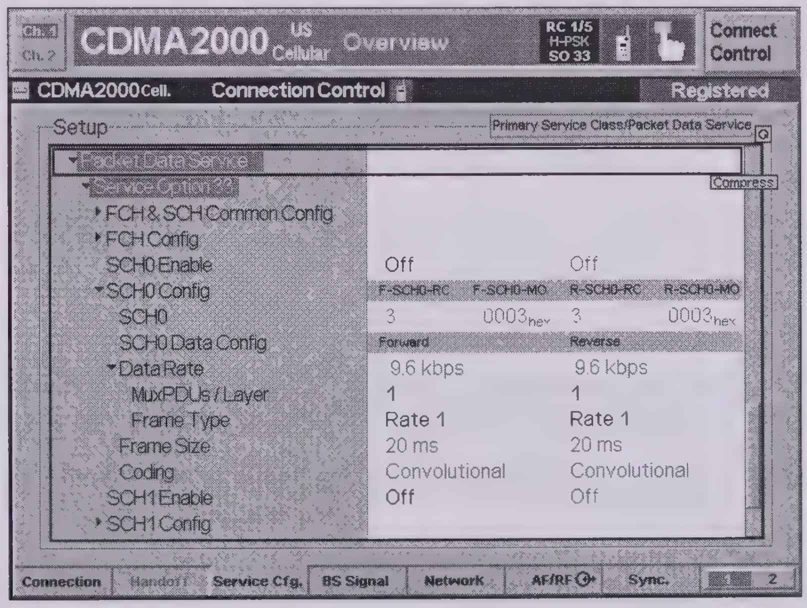
Packet Data Service

Service Option 33 can be configured for *Packet Data Service.* In most cases, Service Option 33 must be activated at the mobile before the mobile can initiate a packet data connection. The *Service Cfg.* settings take effect after the CMU responds to a SO33 Origination Message (ORM) from the mobile.

The traffic channels for SO33 are configured in analogy to Service Option 32 (see section *Test Data Service* on p. 4.115 ff.), however, the definition of a transferred bit pattern is replaced by the determination of IP addresses for the CMU and for the mobile under test.

Application examples for Service Option are listed in section *Setting Up an IP Connection* on p. 4.151 ff.

Connect Control →



Packet Data Service				
Service Option 33				
FCH & SCH Common Config				
FCH Config				
SCH0 Enable	Off		Off	
SCH0 Config	F-SCH0-RC	F-SCH0-MO	R-SCH0-RC	R-SCH0-MO
SCH0	3	0003hex	3	0003hex
SCH0 Data Config	Forward		Reverse	
Data Rate	9.6 kbps		9.6 kbps	
MuxPDUs / Layer	1		1	
Frame Type	Rate 1		Rate 1	
Frame Size	20 ms		20 ms	
Coding	Convolutional		Convolutional	
SCH1 Enable	Off		Off	
SCH1 Config				

Figure 4-62 Connection Control – Service Configuration (Packet Data Service)

Packet Data Service *Packet Data Service – Service Option 33* is highlighted if packet data service is selected as *1st Service Class.*

Remote control

```
CONFigure:SCONfig:SCLass<nr>:SERVice  PDAT
```

```
PROCedure:SCONfig:SCLass<nr>:SERVice  PDAT
CONFigure:SCONfig:SCLass<nr>:PDAT:SOPTion?
```

Service Option 33 *Service Option 33* is used to request packet data service through a serving node supporting an Internet standard Point-to-Point Protocol (PPP) interface to network layer protocols. Service Option 33 meets the requirements described in standard 3GPP2 C.S0017-0-2.12.

FCH & SCH Common Config

FCH & SCH *FCH & SCH* sets the Radio Configuration to use for the forward *(F-RC)* and reverse *(R-RC)* Fundamental Channel and the forward and reverse Supplemental Channels SCH0 and SCH1. The settings made here automatically set the Multiplex Options *(MO)* for both the Fundamental Channel and the Supplemental Channels.

Note: *TX measurements depend on the Reverse Radio Configuration (R-RC) of the mobile station. In general O-QPSK measurements require a R-RC 1 or 2, whereas H-PSK measurements require a R-RC 3 or 4. For an overview see Table 4-4 on p. 4.34 ff.*

Refer to the section *Supplemental Channel Configuration and Dependencies for TDSO* on page 4.119 for more information about Supplemental channel configurations.

Refer to *Connected Service Option Configuration* on page 4.125 about changing Radio Configurations in the Connected signalling state.

Remote Control

```
CONFigure:SCONfig:SCLass<nr>:TDAT:S33D:FSCommon:RC
<F_RC>, <R_RC>
```

Fundamental Channel: FCH Config

FCH *FCH* displays the Radio Configuration and Multiplex Option for the Forward and Reverse Fundamental Channel (*F-FCH-RC* and *R-FCH-RC*, *F-FCH-MO* and *R-FCH-MO*).

These are defined by the FCH & SCH Common Config. settings.

Remote Control

```
CONFigure:SCONfig:SCLass<nr>:TDAT:S33D:FCH:RC
<F_RC>, <R_RC>
```

Supplemental Channels: SCH0 and SCH1

Configuration of the two supplemental channels SCH0 and SCH1 is analogous. In the remote control commands, the keywords `:ZERO` and `:ONE` are used to denote the SCH type.

SCH0/1 Enable *SCH0/1 Enable* disables or enables the forward and reverse supplemental channel 0/1.

Remote Control

```
CONFigure:SCONfig:SCLass<nr>:TDAT:S33D:SCH:<TYPE>:FORWard:ENABle
CONFigure:SCONfig:SCLass<nr>:TDAT:S33D:SCH:<TYPE>:REVerse:ENABle
ON | OFF   (<TYPE> = ZERO | ONE)
```

SCH0/1 Config

SCH0/1

SCH0/1 displays the Radio Configuration and Multiplex Option for the forward and reverse supplemental channels *(F-SCH0/1-RC* and *R-SCH0/1-MO)*.

These are defined by the FCH & SCH Common Config. settings.

Remote Control

```
CONFigure:SCONfig:SCLass<nr>:TDAT:S33D:SCH:<TYPE>
      :FORWard:CBFRames
CONFigure:SCONfig:SCLass<nr>:TDAT:S33D:SCH:<TYPE>
      :REVerse:CBFRames
<Circular Buffer Frames>    (<TYPE> = ZERO | ONE)
```

MuxPDUs / Layer

MuxPDUs / Layer selects the number of multiplex Protocol Data Units per Physical Layer SDU for the forward and reverse supplemental channels.

Together with the *Frame Type*, this parameter determines the data rate of the supplemental channels; see *Table 4-9* on p. 4.124.

Remote Control

```
CONFigure:SCONfig:SCLass<nr>:PDAT:S33D:SCH:<TYPE>:FORWard:MPPL
CONFigure:SCONfig:SCLass<nr>:PDAT:S33D:SCH:<TYPE>:REVerse:MPPL
1 | 2 | 4 | 8       (<TYPE> = ZERO | ONE)
```

Frame Type

Frame Type selects the frame type for the forward and reverse supplemental channels.

Together with the *MuxPDUs / Layer*, this parameter determines the data rate of the supplemental channels; see *Table 4-9* on p. 4.124.

Remote Control

```
CONFigure:SCONfig:SCLass<nr>:PDAT:S33D:SCH:<TYPE>:FORWard:FRTYPe
CONFigure:SCONfig:SCLass<nr>:PDAT:S33D:SCH:<TYPE>:REVerse:FRTYPe
1 | 2
CONFigure:SCONfig:SCLass<nr>:PDAT:S33D:SCH:<TYPE>:FORWard:DRATe?
CONFigure:SCONfig:SCLass<nr>:PDAT:S33D:SCH:<TYPE>:REVerse:DRATe?
      (<TYPE> = ZERO | ONE)
```

Coding

Coding selects the channel encoder for the forward and reverse supplemental channels.

Convolutional	Use convolutional encoding. This setting is available for all data rates.
Turbo	Use turbo encoding. This setting is available for high data rates ≥ 19.2 kbps, i.e. for all combinations of *MuxPDUs / Layer* and *Frame Types* except *MuxPDUs / Layer = 1, Frame Types = 1* (see *Table 4-9* on p. 4.124).
Convolutional (Turbo if possible)	Indicates that convolutional coding is used because turbo coding is not supported for the selected data rate of beyond 9.6 kbps *(MuxPDUs / Layer = 1, Frame Types = 1)*. Turbo coding will be set as soon as the data rate is increased beyond 9.6 kbps.

Remote Control

```
CONFigure:SCONfig:SCLass<nr>:PDAT:S33D:SCH:<TYPE>:FORWard:CODing
CONFigure:SCONfig:SCLass<nr>:PDAT:S33D:SCH:<TYPE>:REVerse:CODing
      CONV | CTIP | TURBo      (<TYPE> = ZERO | ONE)
```

IP Address

Definition of the IP addresses for the CMU (BS) and the mobile under test (MS).

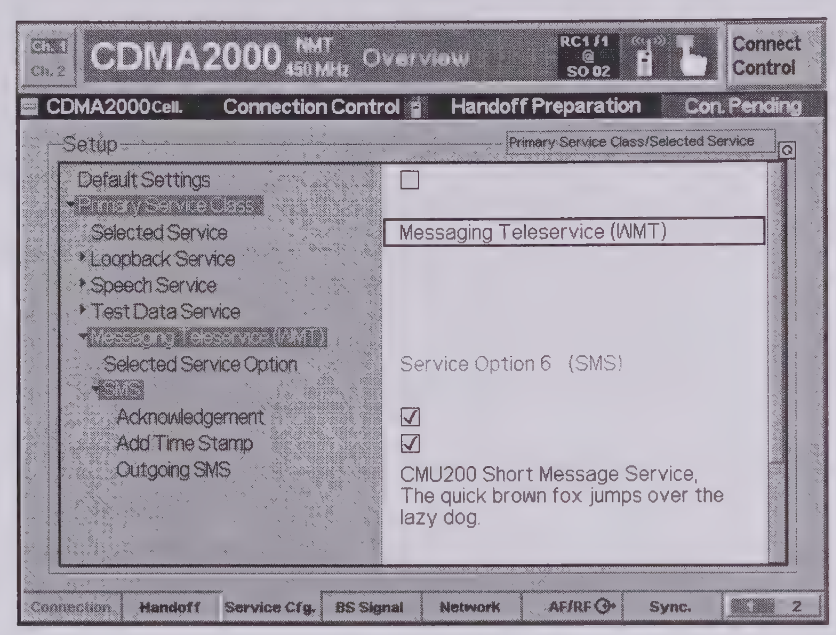
Remote Control

```
CONFigure:SCONfig:SCLass<nr>:PDAT:S33D:REVerse:IPADdress
CONFigure:SCONfig:SCLass<nr>:PDAT:S33D:FORWard:IPADdress
```

Messaging Teleservice (WMT)

Wireless Messaging Teleservice connections are set up with service option 6 at fixed FCH configuration. It is possible to qualify whether the MS acknowledges the received SMS, add a timestamp to each message and define the SMS text.

Connect Control →



Setup

Default Settings ☐

Primary Service Class

Selected Service: Messaging Teleservice (WMT)

Loopback Service

Speech Service

Test Data Service

Messaging Teleservice (WMT)

Selected Service Option: Service Option 6 (SMS)

SMS

Acknowledgement ☑

Add Time Stamp ☑

Outgoing SMS: CMU200 Short Message Service, The quick brown fox jumps over the lazy dog.

Figure 4-63 Connection Control – Service Configuration (Messaging Teleservice)

SMS – Acknowledgement

If the *Acknowledgement* box is checked, the CMU requests the MS to return an *SMS Acknowledge Message* after receiving the short message.

The *Messaging (WMT) Information* section of the info table in the *Connection* tab shows whether or not the last outgoing short message was acknowledged; see section *Connection Control with Connection Established* on p. 4.104 ff. *Not Acknowledged* can indicate that acknowledgement was either not requested or not supported by the mobile.

Remote control
`CONFigure:SCONfig:SCLass<nr>:WMT:SMS:ACKNowledge:ENABle`

SMS – Add Time Stamp

If the *Add Time Stamp* box is checked, the CMU adds a the string *CMU200* and the current time at the beginning of each short message sent, making different short messages with the same text distinguishable.

The time stamp prevent the MS from rejecting repeated identical messages.

Remote control
`CONFigure:SCONfig:SCLass<nr>:WMT:SMS:TSTAmp:ENABle ON | OFF`

Outgoing SMS

The *Outgoing SMS* section contains the short message text to be sent. The number of characters is limited to 152 because 8 characters are reserved for the optional time stamp.

Remote control
`CONFigure:SCONfig:SCLass<nr>:WMT:SMS:TEXT <"Text">`

Service Option 6 (SMS) The *Service Option 6 (SMS)* section displays the fixed FCH configuration for SMS connections set up in the *Signal On* or *Registered* state using Service Option 6; see *Send SMS* softkey on p. 4.41.

Remote control
`CONFigure:SCONfig:SCLass<nr>:WMT:S06D:FCH?`

SMS @ Current Connection The *SMS @ Current Connection* section displays the fixed FCH configuration for SMS connections set up in the *Connected* state; see section *Connection Control with Connection Established* on p. 4.104 ff.

Remote control
–

Supplemental Channel Configuration and Dependencies for TDSO

The CMU200 allows configuration of the TDSO MuxPDU and Frame Type resulting in a specific Supplemental Channel (SCH) Data Rate. The SCH rate is expressed in multiples of a base rate. For example, odd multiplex options have the base rate 9600 bps; a 2x SCH rate is twice that of 9600 bps (or 19200 bps). *Table 4-8* shows the dependency of the Walsh Code which is used for the Supplemental Channel in dependency of the Frame Type and the Frame Size. The Data Rate of the Supplemental Channel depends on the MuxPDUs per Physical Layer SDU and the Frame Type as illustrated in *Table 4-9*.

Table 4-8 MuxPDUs per Physical Layer per Frame Size

MuxPDUs per physical layer SDU		**Frame Size**		
Frame Type		**RC 3**	**RC 4**	**RC 5**
Rate 1	**Rate 2**	**20 ms**	**20 ms**	**20 ms**
1		W_n^{64}	W_n^{128}	W_n^{64}
2	1	W_n^{32}	W_n^{64}	W_n^{32}
4	2	W_n^{16}	W_n^{32}	W_n^{16}
8	4	W_n^{8}	W_n^{16}	W_n^{8}
	8	W_n^{4}	W_n^{8}	W_n^{4}

FSCHs are assigned W_n^N, where N = 4, 8, 16, 32, 64, and 128 for the maximum assigned QPSK symbol rate The maximum assigned QPSK symbol rate depends on the radio class, frame size, and multiplex option. The multiplex option depends on the frame type (Rate 1 or Rate 2) and MuxPDUs per physical layer SDU. Any QOF may be used. This table illustrates the Walsh selection versus the combinations of these parameters.

Table 4-9 MuxPDUs per Physical Layer per Data Rate

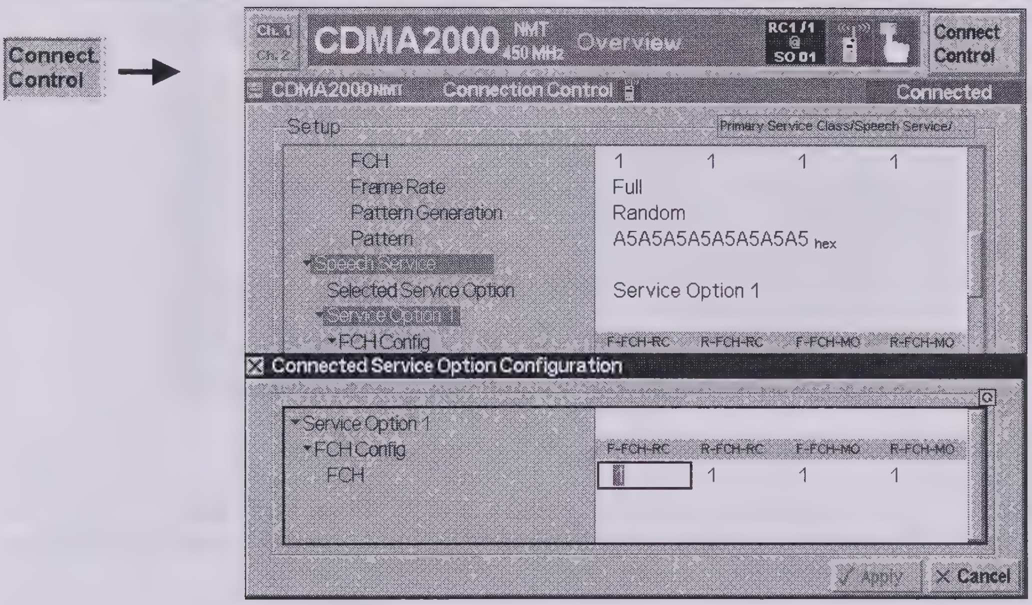
MuxPDUs per Physical Layer SDU	**Data Rate (kbps)**			
	F-SCH RC = 3, 4 R-SCH RC = 3		**F-SCH RC = 5 R-SCH RC = 4**	
	Frame Type		**Frame Type**	
	Rate 1	**Rate 2**	**Rate 1**	**Rate 2**
1	9.6	19.2	14.4	28.8
2	19.2	38.4	28.8	57.6
4	38.4	76.8	57.6	115.2
8	76.8	153.6	115.2	230.4

Connected Service Option Configuration

With the CMU, it's possible to change the forward and reverse radio configuration while connected to a mobile station (signalling state connected). When attempting to change the radio configuration of the selected service option during a call, the pop-up screen *Connected Service Option Configuration* (shown in *Figure 4-64*) is displayed. With this screen, you can enter the new radio configurations and apply the change.

This represents for example an intergeneration handoff between a cdmaOne connection and a CDMA2000 connection.

Note: *The change only takes effect if the mobile station supports the new radio configuration.*


Connect Control
Ch. 1
Ch. 2
CDMA2000 NMT 450 MHz
Overview
RC1/1 @ SO 01
Connect Control
CDMA2000 NMT Connection Control
Connected
Setup
Primary Service Class/Speech Service/
Connected Service Option Configuration
Apply
Cancel

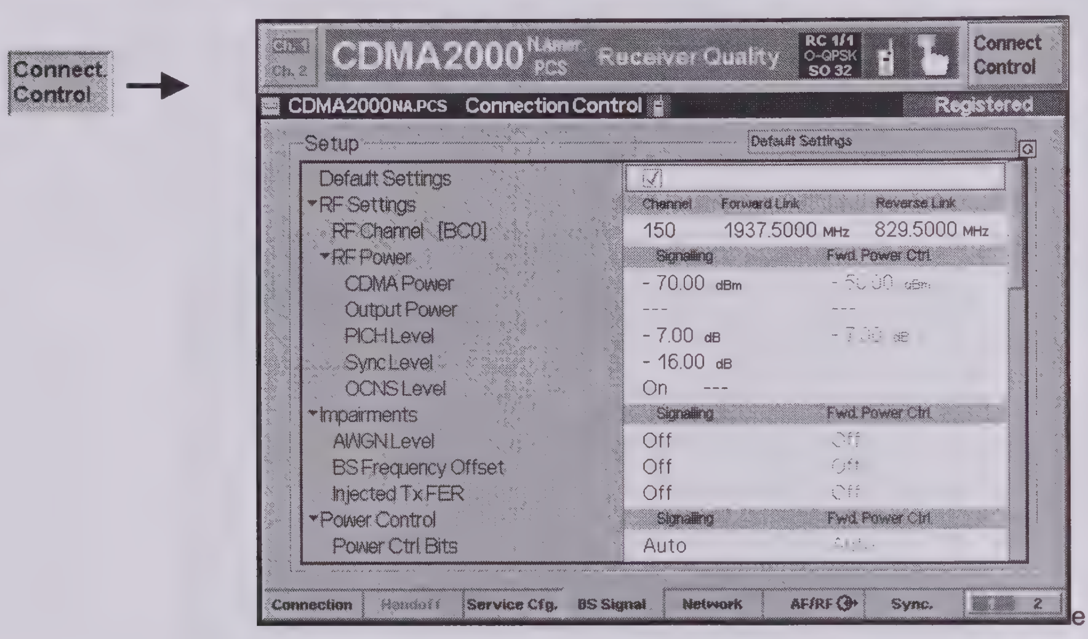
FCH 1 1 1 1
Frame Rate Full
Pattern Generation Random
Pattern A5A5A5A5A5A5A5A5 hex
Speech Service
Selected Service Option Service Option 1
Service Option 1
FCH Config F-FCH-RC R-FCH-RC F-FCH-MO R-FCH-MO

Service Option 1
FCH Config F-FCH-RC R-FCH-RC F-FCH-MO R-FCH-MO
FCH 1 1 1 1

Figure 4-64 Connection Control – Connected Service Option Configuration

Signals of the CMU (Connection Control – BS Signal)

The popup menu *BS Signal* configures the forward CDMA signal generated by the CMU including all physical channel contributions. Some signal settings must be performed before a call is sent to the mobile station. They are available in the signalling states *Signal Off, Signal On,* and *Registered*. For detailed information refer to the description of remote control commands in Chapter 6.



Default Settings	☑		
▾RF Settings	Channel	Forward Link	Reverse Link
RF Channel [BC0]	150	1937.5000 MHz	829.5000 MHz
▾RF Power	Signaling		Fwd. Power Ctrl
CDMA Power	- 70.00 dBm		- 50.00 dBm
Output Power	---		---
PICH Level	- 7.00 dB		- 7.00 dB
Sync Level	- 16.00 dB		
OCNS Level	On ---		
▾Impairments	Signaling		Fwd. Power Ctrl
AWGN Level	Off		Off
BS Frequency Offset	Off		Off
Injected Tx FER	Off		Off
▾Power Control	Signaling		Fwd. Power Ctrl
Power Ctrl Bits	Auto		Auto

Figure 4-65 Connection Control – BS Signal

Default Settings	The *Default Settings* switch assigns default values to all settings in the *BS Signal* tab (the default values are quoted in the command description in chapter 6 of this manual). Remote control `DEFault:BSSignal ON | OFF`

RF Settings

RF Channel	The *RF Channel* sets the base station channel number (and frequency) of the generated RF signal. Changing the RF Channel resets the RF Frequency setting and vice versa. The default settings for the channel numbers are dependent on the network selected. See Chapter 1 for a list of the networks and standards supported by the CMU with the CDMA options.

Remote Control	`CONFigure:BSSignal:CHANnel:FFCH`
	`PROCedure:BSSignal:CHANnel:FFCH`
	`<FFCH Channel>`

CDMA Power	*CDMA Power* allows you to set the total CDMA output power. The CDMA Power level does not include the AWGN power level.

Remote Control

```
CONFigure:BSSignal:POWer:CDMA
PROCedure:BSSignal:POWer:CDMA
<CDMA Power>
```

Output Power

Output Power displays the total output power. The total Output Power level includes the AWGN power level.

Remote Control

```
CONFigure:BSSignal:POWer:OUTput?
```

Sync Level

Sync Level allows you to set the signal level of the sync channel in the forward CDMA channel.

Remote Control

```
CONFigure:BSSignal:LEVel:FSYNc
<FSYNC Level>
```

PICH Level

PICH Level allows you to set the Pilot Channel level in the forward CDMA channel.

Remote Control

```
CONFigure:BSSignal:LEVel:FPICh
<FPICH Level>
```

OCNS Level

OCNS turns the Orthogonal Channel Noise Simulator ON or OFF. Setting this to ON ensures a defined Output Power level.

Remote Control

```
CONFigure:BSSignal:LEVel:OCNS:ENABle
ON | OFF
```

Impairments

Modifies the BS Signal to simulate realistic operating propagation conditions in the cell.

AWGN Level

Turns on or off the Additive White Gaussian Noise generator and sets the level for modulation. This provides noise to more closely simulate actual operating conditions.

Note: *The total output power of the CMU is the sum of the Forward CDMA signal plus the AWGN signal. The CMU automatically limits the AWGN signal level so that the maximum possible total output power of the CMU's RF connector is not exceeded.*

Remote Control

```
CONFigure:IMPairments:LEVel:AWGN
<AWGN Level>
```

Carrier Frequency Offset

Adjusts the carrier frequency of the CMU's BS Signal. This setting is disabled if the RF Frequency is adjusted away from a standard RF Channel frequency.

Remote Control

```
CONFigure:IMPairments:FOFFset[:RF]
<Freq. Offset>
```

Injected Tx FER

Defines a percentage of faulty (i.e. erasure) frames that the CMU injects into all traffic channels of its BS Signal *(F-FCH, F-SCH0, F-SCH1)*. To ensure that the data flow is still considered to be valid, up to 50 % of the traffic channel frames may be erasure frames. Channels used for signalling are not affected so that the impairment will not disturb the connection.

The *Injected Tx FER* is a useful tool for a variety of tests:

- Test of the FER reported by the mobile and displayed in the *Receiver Quality* menu. At high BS Signal level, the reported FER should be equal to the *Injected Tx FER.*
- Test of the voice coder performance in a speech service connection with poor forward signal quality.
- Test of modulation accuracy or forward power control with poor forward signal quality.

Remote Control

`CONFigure:IMPairments:ITFer`
`<FER>`

Power Control

Power Control Bits

Power Ctl. Bits defines the Power Control Bit (PCB) sequence that the CMU sends to the mobile station to control its total output power (closed loop power control).

Note: *The power control bits must be compatible with the measurement task. All PCB modes except* Auto *can drive the MS transmitter outside the power range necessary for a particular measurement.*

Auto	Active closed loop power control: the CMU sends the power control bits needed to control the MS transmitter output power to the expected value (equal to the RF Max. Level, see section *Analyzer Control (Connection Control – Analyzer)* on p. 4.141 ff.). The *Expected MS Power* is also indicated in the Overview menu.
Hold	The CMU sends alternating up/down power control bits.
All Down	The CMU sends only down power control bits. This will cause the mobile station's power level to decrease to a level too low for measurements to be made.
All Up	The CMU sends only up power control bits.
Range Test	The CMU sends a sequence of 128 up power bits (= 8 frames) followed by a sequence of 128 down power bits.
Pattern	Use the bit sequence defined in the *Pattern* section.
Off	No bits are sent to the mobile station.

Remote Control

`CONFigure:BSSignal:PCBits`
`OFF | AUTomatic | HOLD | ADOW | AUP | RTES | PATTern`

Pattern – Step Size

Step Size selects the step size that the mobile station is to use for closed loop power control. The step size is the nominal change of the MS transmit power per single power control bit. Some step sizes require a particular protocol revision:

Step size	0.25 dB	0.5 dB	1.0 dB
Supported by protocol revisions	1 to 6	4 to 6	6

Note: *Changing the* Protocol Revision *of the CMU (see p. 4.134) resets the Power Control Step Size to its default value of 1.00 dB.*

Remote Control

`CONFigure:BSSignal:PCBits:SSIZe`
`0.25 | 0.50 | 1.00`

Pattern – Sequence Mode

Sequence Mode selects an algorithm to construct the complete user-defined pattern from the single bit pattern *<Pattern>* defined in *Area 1* to *Area 4;* see *Table 4-10 below.*

Remote Control

`CONFigure:BSSignal:PCBits:PATTern:SQMode`
`PREP | PFBA | PFBH`

Table 4-10 Single pattern and Sequence Mode

Sequence Mode	**Complete transferred pattern for a single pattern <Pattern>**
Pattern Repeated	<Pattern><Pattern><Pattern>...
Pattern followed by Auto	<Pattern>, then active closed loop power control
Pattern followed by Hold	<Pattern>01010101....

Pattern – Area1 / ... / Area 4

Area 1, ..., Area 4 contains the parameters to define the single bit pattern <Pattern>. <Pattern> is composed of 4 areas with variable length ≥ 1 *(Number of Bits)* but constant *Polarity.*

Example: 000011110 is valid <Pattern>. The following combination of parameters can be used to define this pattern:

Area 1,	Number of Bits	4
	Last Hold Bit	Down
Area 2,	Number of Bits	1
	Polarity	Up
Area 3,	Number of Bits	3
	Polarity	Up
Area 4,	Number of Bits	1
	Polarity	Down

Remote Control

```
CONFigure:BSSignal:PCBits:PATTern:AREA<nr>:NOBits
CONFigure:BSSignal:PCBits:PATTern:AREA1:LHBit
CONFigure:BSSignal:PCBits:PATTern:AREA<nr>:POLarity
```

FCH

FCH

FCH selects the Fundamental Channel to use in the forward CDMA channel. The channel selection range is dependent on the current setting of the Forward Radio Configuration.

F-FCH Level

The F-FCH Level sets the signal level of the Fundamental Channel in the forward CDMA channel.
F-FCH Level specifies the FULL frame rate traffic channel level. If a frame rate other than FULL is used, the actual test traffic level is lower:
Test traffic level = F-FCH Level + Corr.
The level correction values Corr. are listed in the table below.

	RC 1		RC 2		RC 3, 4		RC 5	
	bps	Corr./ dB	bps	Corr./ dB	bps	Corr./ dB	bps	Corr./ dB
Full	9600	0	14400	0	9600	0	14400	0
Half	4800	–3	7200	–3	4800	–3	7200	–3
Quarter	2400	–6	3600	–6	2700	–5.5	3600	–6
Eighth	1200	–9	1800	–9	1500	–8	1800	–9

Remote Control

```
CONFigure:BSSignal:CHANnel:FFCH
PROCedure:BSSignal:CHANnel:FFCH
<FFCH Channel>
```

FCH Level

F-FCH Level adjusts the signal level of the Fundamental Channel in the forward CDMA channel.

Remote Control

```
CONFigure:BSSignal:LEVel:FFCH
PROCedure:BSSignal:LEVel:FFCH
<FFCH Level>
```

FCH Eb/Nt

FCH Eb/Nt displays the calculated signal to noise ratio of the Fundamental Channel in the forward CDMA channel. The value is displayed while the Additive White Gaussian Noise generator is turned on; otherwise Eb/Nt is undefined as the noise level Nt tends to zero.

Eb/Nt Calculation

The signal to noise ratio is calculated according to standard IS.98, section 1.4.2.1:

$$\frac{FCH\_E_b}{N_t} = \frac{\hat{I}_{or}}{I_{or}} \cdot \frac{FCH\_E_c \cdot FCH\_Chip\_Bit}{I_{oc}}$$

Where:	FCH_E_c	*Average transmit energy per PN chip*
	FCH_Chip_Bit	*Number of PN chips per TCH bit*
	$\hat{I}_{or}$	*Power spectral density of the FW CDMA channel received at the MS antenna connector*
	I_{or}	*Total transmit power spectral density of FW CDMA channel at BS antenna connector*
	I_{oc}	*Power spectral density of an AWGN source, measured at the MS antenna connector*

If the attenuation between the BS (CMU) and the MS under test is negligible ($\hat{I}_{or} = I_{or}$), then Eb/Nt is given by the *FCH Level*, the *AWGN Level* and the data rate in the forward channel (see *Table 4-9* on p. 4.124):

$$\frac{FCH\_E_b}{N_t} = \left(< FCH\ Level > +10 \cdot \log \frac{1{,}228{,}800}{< Data\ Rate >} + < AWGN\ Level > \right) dB$$

The Eb/Nt calculation for the Supplemental Channels SCH0 and SCH1 is analogous to the FCH.

Remote Control

```
CALCulate[:SCALar]:BSSignal:EBNT:FFCH?
<Ratio>
```

FCH QOF

FCH QOF selects the Quasi-orthogonal Function that the Forward Fundamental Channel uses in the forward CDMA channel.

Remote Control

```
CONFigure:BSSignal:QOF:FFCH
PROCedure:BSSignal:QOF:FFCH
<QOF>
```

FCH Frame Offset

F-FCH Frame Offset sets the frame offset in the Fundamental Channel. Changing the frame offset immediately changes the traffic channel timing.

Remote Control

```
CONFigure:BSSignal:FROFfset:FFCH
PROCedure:BSSignal:FROFfset:FFCH
<Frame Offs>
```

Supplemental Channels: SCH0 and SCH1

Configuration of the two supplemental channels SCH0 and SCH1 is analogous. In the remote control commands, the keywords `:ZERO` and `:ONE` are used to denote the SCH type.

SCH0/1 Channel

SCH0/1 Channel selects the Supplemental Channel to use in the forward CDMA channel. The channel selection range is dependent on the current setting of the Forward Radio Configuration.

Remote Control

```
CONFigure:BSSignal:CHANnel:FSCH:<TYPE>
PROCedure:BSSignal:CHANnel:FSCH:<TYPE>
<FSCH Channel>    (<TYPE> = ZERO | ONE)
```

SCH0/1 Level

SCH0/1 Level adjusts the signal level of the Supplemental Channel in the forward CDMA channel.

Remote Control

```
CONFigure:BSSignal:LEVel:FSCH:<TYPE>
PROCedure:BSSignal:LEVel:FSCH:<TYPE>
<FSCH0/1 Level>    (<TYPE> = ZERO | ONE)
```

SCH0/1 Eb/Nt

FCH Eb/Nt displays the calculated signal to noise ratio of the Supplemental Channel in the forward CDMA channel. The value is displayed while the Additive White Gaussian Noise generator is turned on; otherwise Eb/Nt is undefined as the noise level Nt tends to <Type>.

Remote Control

```
CALCulate[:SCALar]:BSSignal:EBNT:FSCH:<TYPE>?
<Ratio>    (<TYPE> = ZERO | ONE)
```

SCH0/1 QOF

SCH0/1 QOF selects the Quasi-orthogonal Function that the Supplemental Channel uses in the forward CDMA channel.

Remote Control

```
CONFigure:BSSignal:QOF:FSCH:<TYPE>
PROCedure:BSSignal:QOF:FSCH:<TYPE>
<QOF>    (<TYPE> = ZERO | ONE)
```

SCH0/1 Frame Offset

SCH0/1 Frame Offset sets the frame offset in the Supplemental Channel. Changing the frame offset immediately changes the traffic channel timing.

Remote Control

```
CONFigure:BSSignal:FROFfset:FSCH:<TYPE>
PROCedure:BSSignal:FROFfset:FSCH:<TYPE>
<Frame Offs>    (<TYPE> = ZERO | ONE)
```

PCH

PCH

PCH Channel selects the Paging Channel to use in the forward CDMA channel. The channel selection range is dependent on the current setting of the Forward Radio Configuration.

Remote Control

```
CONFigure:BSSignal:CHANnel:FPCH
PROCedure:BSSignal:CHANnel:FPCH
<FPCH Channel>
```

PCH Level

PCH Level adjusts the signal level of the Paging Channel in the forward CDMA channel relative to the total output power.

Remote Control

```
CONFigure:BSSignal:LEVel:FPCH
PROCedure:BSSignal:LEVel:FPCH
<FPCH Level>
```

QPCH

QPCH Usage

QPCH Usage enables or disables the use of the quick paging channel. The quick paging channel performs two functions: paging and configuration change indication. Using the quick paging channel may reduce the amount of time the mobile station uses to monitor the paging channel.

Remote Control

```
CONFigure:BSSignal:USAGe:FQPCh
PROCedure:BSSignal:USAGe:FQPCh
ON | OFF
```

QPCH

QPCH selects the Quick Paging Channel to use in the forward CDMA channel. The channel selection range is dependent on the current setting of the Forward Radio Configuration.

Remote Control

```
CONFigure:BSSignal:CHANnel:FQPCh?
PROCedure:BSSignal:CHANnel:FQPCh?
<Quick Paging Channel>
```

QPCH Level

QPCH Level adjusts the signal level of the Quick Paging Channel in the forward CDMA channel relative to the total output power.

Remote Control

```
CONFigure:BSSignal:LEVel:FQPCh
PROCedure:BSSignal:LEVel:FQPCh
<Quick Paging Level>
```

Indicator Bits

This command sends the quick paging channel indicator bits to the mobile station to instruct the mobile to monitor the assigned paging channel slot or go to sleep mode. Two bits are sent to increase reliability. The bits are read as follows:

Read bit 1	Bit 1 = 1:	Read bit 2
	Bit 1 = 0:	Mobile to sleep mode
Read bit 2	Bit 2 = 1:	Mobile monitors paging channel
	Bit 2 = 0:	Mobile to sleep mode

Remote Control

```
CONFigure:BSSignal:IBITs:FQPCh
PROCedure:BSSignal:IBITs:FQPCh
<I Bits>
```

DUT Paging	*DUT Paging* enables or disables the quick paging channel of the mobile station under test.

Remote Control	`CONFigure:BSSignal:DUTPaging:FQPCh`
	`PROCedure:BSSignal:DUTPaging:FQPCh`
	`ON | OFF`

Base Station Properties

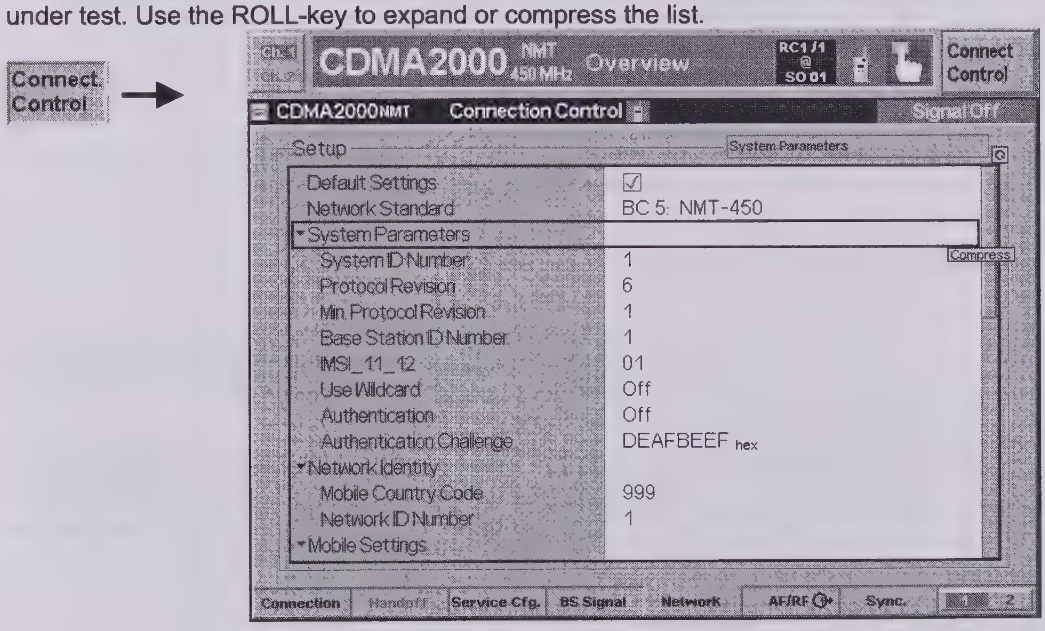
PN Offset	*PN Offset* sets the offset of the PN sequence. Changing the PN offset changes the timing of the pilot channel, the timing and contents of the sync channel message, and the long code mask of the paging channel.

Remote Control	`CONFigure:BSSignal:PROPerty:PNOFfset`
	`PROCedure:BSSignal:PROPerty:PNOFfset`
	`<PN Offs>`

Call Loss Detect Time	*Call Loss Detect Time* sets the value of the fade timer (in increments of 0.1 seconds) to detect when a call is lost or dropped.
Remote Control	`CONFigure:BSSignal:PROPerty:CLDTime` *`<Time>`*

Network Parameters (Connection Control – Network)

The popup menu *Network* displays the current network settings to match that of the mobile station under test. Use the ROLL-key to expand or compress the list.



Default Settings	☑
Network Standard	BC 5: NMT-450
▾System Parameters	
System ID Number	1
Protocol Revision	6
Min. Protocol Revision	1
Base Station ID Number	1
IMSI_11_12	01
Use Wildcard	Off
Authentication	Off
Authentication Challenge	DEAFBEEF hex
▾Network Identity	
Mobile Country Code	999
Network ID Number	1
▾Mobile Settings	

Figure 4-66 Connection Control – Network Parameters

Default Settings	The *Default Settings* switch assigns default values to all settings in the *Network* tab (the default values are quoted in the command description in chapter 6 of this manual).

Remote control
–

System Parameters

System IDNumber	*SID* is the System Identification.
Remote Control	`CONFigure:NETWork:SYSTem:SID` *`<System ID Number>`*
Protocol Revision	*Protocol Revision* sets the preferred version of the protocol for the CMU to use. ***Note:*** *Changing the Protocol Revision of the CMU resets the Power Control Step Size (see p.4.129) to its default value of 1.00 dB.*
Remote Control	`CONFigure:NETWork:SYSTem:PREVision` *`<Protocol Revision>`*
Min. Protocol Revision	*Min. Protocol Revision* sets the minimum protocol revision capability of the mobile station.
Remote Control	`CONFigure:NETWork:SYSTem:MPRevision` *`<Minimum Protocol Revision>`*
Base Station ID	*Base Station ID* sets the base station identification.
Remote Control	`CONFigure:NETWork:SYSTem:BSID` *`<Base Station ID Number>`*
IMSI_11_12	*IMSI_11_12* defines an ASCII string containing two digits representing the 11th and 12th digits of the IMSI of the base station.
Remote Control	`CONFigure:NETWork:SYSTem:IMSI:ETWelve` *`<IMSI 11 12>`*
Use Wildcard	*Use Wildcard* indicates whether to use special values for MCC and IMSI_11_12 that indicate to the mobile that it needs to use only IMSI_S.
Remote Control	`CONFigure:NETWork:SYSTem:UWCard` `ON | OFF`
Authentication	*Authentication* switches the authentication mode on or off. Authentication is a procedure by which information is exchanged between the base station/CMU and the mobile station for the purpose of confirming the identity of the mobile station; see standard TIA/EIA/IS-2000.5-A. The information sent to the MS is entered in the *Authentication Challenge* field; see below. If authentication fails, this is shown in the *MS Information – Authentication* section of the info table in the *Connection* tab; see section *Connection Control with Connection Established* on p. 4.104 ff.
Remote Control	`CONFigure:NETWork:SYSTem:AUTHentic` `ON | OFF`

Authentication Challenge	*Authentication Challenge* defines the information sent to the mobile station for authentication, i.e. the 32-bit quantity RAND_CHALLENGE in the Authentication Challenge Message (see standard TIA/EIA/IS-2000.5-A). The authentication challenge is entered as a 8-digit hex value.
Remote Control	`CONFigure:NETWork:SYSTem:ACHallenge` *`<Challenge>`*

Network Identity

Network IDNumber	*NID* is the Network Identification.
Remote Control	`CONFigure:NETWork:IDENtity:NID` *`<Network ID Number>`*
Mobile Country Code	*Mobile Country Code* is the MCC of the network.
Remote Control	`CONFigure:NETWork:IDENtity:MCC` *`<Mobile Country Code_Network>`*

Mobile Settings

Mobile Country Code	*Mobile Country Code* is the MCC of the mobile station.
Remote Control	`CONFigure:MSSInfo:MCC` *`<Mobile Country Code>`*
Mobile ID(MIN/IMSI)	*Mobile ID (MIN/IMSI)* contains a MIN or IMSI (mobile ID) that is used to set up a connection. The mobile ID is not mandatory. However, it provides the tester with the necessary information so that the *Connect MS* softkey (see p. 4.39) can be used without waiting for registration. Alternatively the mobile ID can be retained from the last mobile station to register with the tester; see *Use Mobile Registration Data* below. For some protocol revisions, you can choose either a MIN or an IMSI mobile ID. For other protocol revisions, a choice of mobile ID is not available. ***Note:*** *The CMU requires either a MIN or an IMSI mobile identification type.*
Remote Control	`CONFigure:MSSInfo:ID` *`<Mobile ID (MIN/IMSI>`*
Use Mobile Registration Data	If *Use Mobile Registration Data* is active (box checked), the mobile ID received during registration is retained and entered in the *Min/IMSI (Registration Data)* field. The received ID can be used to set up the following calls from the *Signal On* state; see above. This is useful if the same mobile is to be called repeatedly. If the option is not active, any call is attempted using the *Mobile ID (MIN/IMSI)*.
Remote Control	`CONFigure:MSSignal:ID:URData ON | OFF`
Min/IMSI (Registration Data)	*Min/IMSI (Registration Data)* indicates the mobile ID received during the last registration. The received ID is used to set up the following calls if *Use Mobile Registration Data* is enabled.

Remote Control	`CONFigure:MSSignal:ID:URData ON` `CONFigure:MSSInfo:ID?` (to be queried after registration)

Paging

Paging Channel Rate	*Paging Channel Rate* sets the paging rate of the base station's paging channel.
Remote Control	`CONFigure:NETWork:PCHannel:RATE` `R4K8 | R9K6`
Paging Channel Slot Cycle Index	*Paging Channel Slot Cycle Index* determines the length of the slot cycle by setting the number of slots in the slot cycle. Each slot cycle equals 1.28 seconds. The number of slots in the slot cycle is determined by the formula: Slot cycle = 1.28×2^i (where i equals the slot cycle index) For example: i = 0 Slot cycle = 1.28 seconds i = 1 Slot cycle = 2.56 seconds i = 2 Slot cycle = 5.12 seconds The paging channel is monitored during the slot cycle when operating in the slotted mode. A mobile stations slot occurs once per slot cycle
Remote Control	`CONFigure:NETWork:PCHannel:SCINdex` *`<Paging CH Slot Cycle Index>`*
Max. Slot Cycle Index	*Max. Slot Cycle Index* sets the maximum slot cycle index allowed to determine the slot cycle length.
Remote Control	`CONFigure:NETWork:PCHannel:MSCindex` `<Max Slot Cycle Index>`

Registration

Timer Based	*Timer Based Registration* sets the interval that the mobile station is to use to register with the tester. You can set a range of values from 12 seconds to approximately 2 minutes. If set to OFF, the mobile station discontinues periodic registration with the tester.
Home	*Home* enables the home (non-roaming) registration mode.
Remote Control	`CONFigure:NETWork:REGistration:HOME` `ON | OFF`
Foreign SID	*Foreign SID* enables the SID registration mode.
Remote Control	`CONFigure:NETWork:REGistration:FSID` `ON | OFF`
Foreign NID	*Foreign NID* enables the network ID registration mode.
Remote Control	`CONFigure:NETWork:REGistration:FNID` `ON | OFF`

Power Up *Power Up* enables the power-up registration mode.

Remote Control
```
CONFigure:NETWork:REGistration:PUP
ON | OFF
```

Power Down *Power Down* enables the power-down registration mode.

Remote Control
```
CONFigure:NETWork:REGistration:PDOWn
ON | OFF
```

Parameter Reg. *Parameter Reg.* enables the parameter registration mode, causing re-registration after a parameter change.

Remote Control
```
CONFigure:NETWork:REGistration:PARameter
ON | OFF
```

Access Probes

Access Probes *Access Probes* allows you to set the CMU to ignore or acknowledge the access probes from the mobile station.

Remote Control
```
CONFigure:NETWork:APRobes:MODE
ON | OFF
```

Nominal Offset *Nominal Offset* sets the nominal transmit power of the access probes. The offset range is dependent on the Network setting.

Remote Control
```
CONFigure:NETWork:APRobes:NOFFset
<Offset>
```

Initial Offset *Initial Offset* sets the value of the initial transmit power offset of the access probes.

Remote Control
```
CONFigure:NETWork:APRobes:IOFFset
<Offset>
```

Probe Increment *Probe Increment* sets the size of the power step between access probe sequences.

Remote Control
```
CONFigure:NETWork:APRobes:PINCrement
<Increment>
```

Probes per sequence *Probes per sequence* sets the number of access probes contained within the access probe sequence.

Remote Control
```
CONFigure:NETWork:APRobes:PPSQuence
<Probes>
```

Sequences per attempt *Sequences per attempt* sets the number of access probe sequences during the access attempt.

Remote Control
```
CONFigure:NETWork:APRobes:SPATtempt
<Sequences>
```

AF/RF Connectors (Connection Control – AF/RF)

The popup menu AF/*RF* ⟴ selects the connectors for RF signals. This includes defining the following.

- The RF input and output of the CMU (*RF Output*, *RF Input*).
- External attenuation at the connectors (*Ext. Att. Output*, *Ext. Att. Input*).
- The input source of the CMU speech encoder and the output destination of the speech decoder.

If the Audio Generator and Analyzer (option CMU-B41) is not installed, the *Speech Encoder* and *Speech Decoder* settings are not available. The speech codec is connected to the 9-pole SPEECH (handset) connector on the CMU front panel (refer to the CMU operating manual).

Connect. Control →

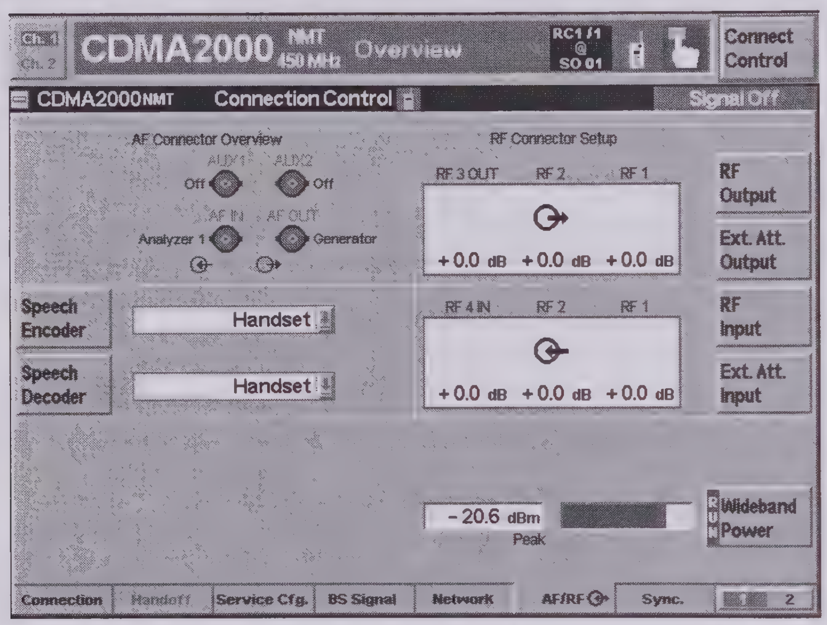


Figure 4-67 Connection Control – AF/RF Connectors

With the exception of the *Speech Encoder* and *Speech Decoder* routing, all functions of this menu are described in CDMA Non-Signalling section titled *AF/RF Connectors (Connection Control – AF/RF*. See also the paragraph titled *Symmetric input/output attenuation* on p. 4.142.

Speech Encoder

The *Speech Encoder* softkey selects the input source for the CMU speech encoder. The following two input sources are available:

Generator	Use the audio generator signal which is also fed to the *AF OUT* connector on the CMU front panel.
Handset	Use the signal of the 9-pole SPEECH (handset) connector on the CMU front panel. The active pins are:

Pin 5	Analog speech input
Pin 6	Analog speech output
Pin 9	Analog ground

Remote Control `ROUTe:SPENcoder[:INPut] HANDset | GENerator`

Speech Decoder

The *Speech Decoder* softkey selects the output destination for the CMU speech decoder (option CMU-B83). The following output destinations are available:

Handset Route speech decoder output to the 9-pole *SPEECH* (handset) connector on the CMU front panel. The analog pins are:

Pin 5	Analog speech input

Pin 6	Analog speech output
Pin 9	Analog ground

Analyzer	Route speech decoder output to audio analyzer. The standard analyzer input socket *AF IN* is disabled *(Off).*
Analyzer 2	Route speech decoder output to secondary audio analyzer. The standard secondary analyzer input socket *AUX 1* is disabled *(Off).*
Analyzer Both	Route speech decoder output to primary audio analyzer. The standard primary and secondary analyzer input sockets *AF IN* and *AUX 1* are disabled *(Off).*

The primary and secondary audio circuits are described in detail in chapter 4 and 6 of the CMU200/300 operating manual.

Remote Control

```
ROUTe:SPDecoder[:OUTPut]
HANDset |ANALyzer |ANA2 | ABOTh
```

AF Connector Overview

The *AF Connector Overview* shows the destination of the input signals fed in via AF IN and AUX 1 and the signals sources for the two audio output connectors AF OUT and AUX 2. The routing of input and output signals does not depend on the *Speech Encoder* settings but is a function of the *Speech Decoder* output destination. In the default configuration *(Speech Decoder = Handset),* the connectors AF IN and AF OUT are used as input and output for the primary audio circuit (Analyzer 1, Generator 1). AUX 1 and AUX 2 are used as input and output for the secondary audio circuit (Analyzer 2, Generator 2). If the *Speech Decoder* output is routed to one of the Analyzers, it replaces the external audio input signal. The corresponding input connector is disabled *(Off*).

Reference Frequency (Connection Control – Sync.)

The popup menu *Sync.* defines the reference signals for synchronization. This includes:

- The internal or external Reference Frequency
- The output mode for the network-specific system clock (REF OUT 2)

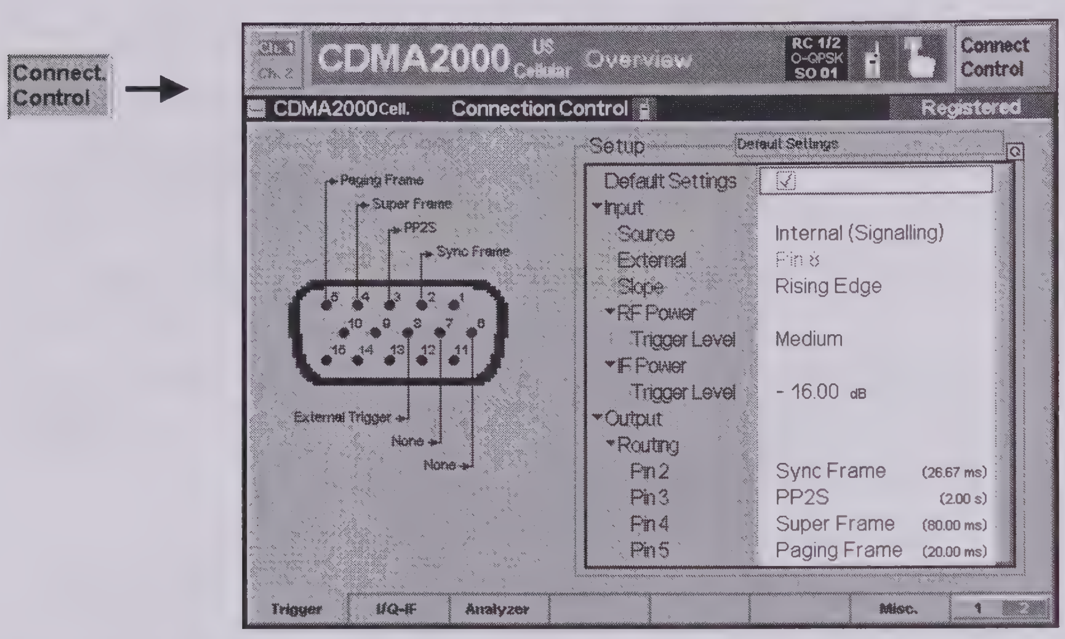
The functions of this menu are described in the CDMA Non-Signalling section titled *Reference Frequency (Connection Control – Sync.).*

Trigger (Connection Control – Trigger)

The *Trigger* tab is part of the second group of tabs in the *Connection Control* menu. It is accessible after pressing the *1 / 2* toggle hotkey once. Pressing *1 / 2* again switches back to the first group of tabs described above.

The *Trigger* tab defines the trigger condition for the measurement and the routing of output trigger signals.

Most trigger settings are identical in *Non Signalling* and *Signalling* mode and described in the CDMA Non Signalling section titled *Trigger (Connection Control – Trigger).* Differences between the two modes are pointed out below.



Default Settings	☑
▾Input	
Source	Internal (Signalling)
External	Pin 8
Slope	Rising Edge
▾RF Power	
Trigger Level	Medium
▾IF Power	
Trigger Level	- 16.00 dB
▾Output	
▾Routing	
Pin 2	Sync Frame (26.67 ms)
Pin 3	PP2S (2.00 s)
Pin 4	Super Frame (80.00 ms)
Pin 5	Paging Frame (20.00 ms)

Figure 4-68 Connection Control – Trigger

Default Settings	The *Default Settings* checkbox assigns the default setting to all functions in the *Trigger* tab (the default values are quoted in the command description in chapter 6 of this manual).
Remote control	`DEFault:TRIGger[:SEQuence]`

Input – Source *Source* selects the source for the trigger event. The settings are analogous to the trigger sources in *Non Signalling* mode; the *Internal (Signalling)* trigger in *Signalling* mode corresponds to the *Internal* trigger in *Non Signalling* mode.

Signalling Trigger signal supplied by the signalling unit of the instrument, according to the expected timing of the RF signal re-transmitted by the MS under test. An output frame trigger signal can be routed to pins 2 to 5 of AUX 3; see below.

Note: *The Signalling trigger signal and the output frame trigger is only available while the BS Signal is switched on (all signalling states except* Signal Off).

Remote control `TRIGger[:SEQuence]:SOURce`

I/Q-IF Interface (Connection Control – I/Q-IF)

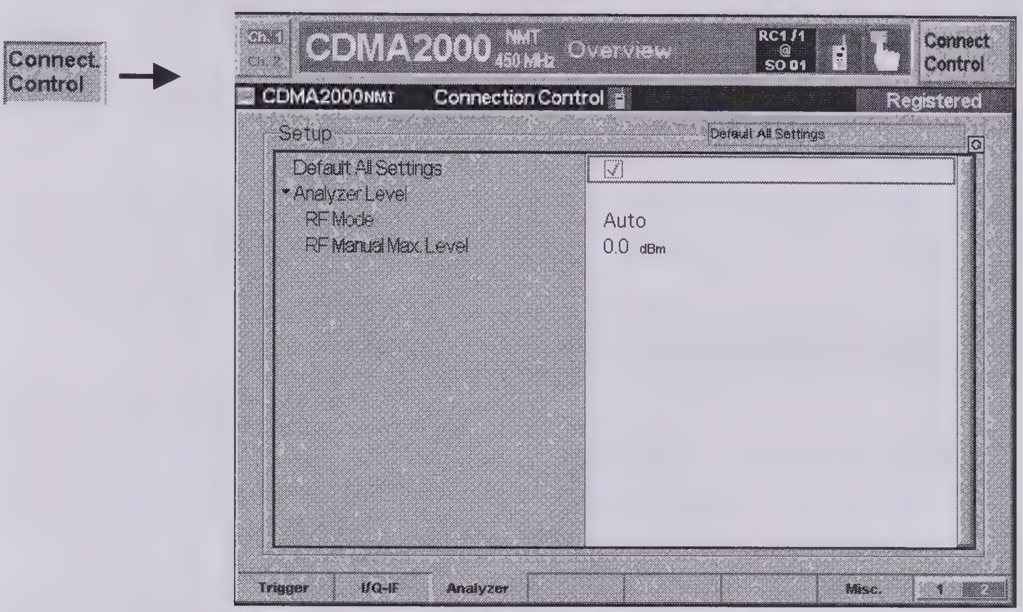
The *I/Q-IF* tab is part of the second group of tabs in the *Connection Control* menu. It is accessible after pressing the *1 / 2* toggle hotkey once. Pressing *1 / 2* again switches back to the first group of tabs described above.

The *I/Q-IF* tab configures the signal paths for I/Q and IF signals. With option CMU-B17, *I/Q and IF Interfaces,* I/Q and IF signals can be used in the framework of *RF* measurements and in many network tests. The functions of this menu are described in the CDMA Non-Signalling section titled *I/Q-IF Interface (Connection Control – I/Q-IF)*.

Analyzer Control (Connection Control – Analyzer)

The *I/Q-IF* tab is part of the second group of tabs in the *Connection Control* menu. It is accessible after pressing the *1 / 2* toggle hotkey once. Pressing *1 / 2* again switches back to the first group of tabs described above.

The *Analyzer* tab configures the RF input path by defining the analyzer level.



Default All Settings	☑
▾ Analyzer Level	
RF Mode	Auto
RF Manual Max. Level	0.0 dBm

Figure 4-69 Connection Control – Analyzer Settings

Default All Settings	The *Default All Settings* switch assigns default values to all settings in the *Analyzer* tab (the default values are quoted in the command description in chapter 6 of this manual). Remote control `DEFault:RFANalyer`

Analyzer Level – RF Mode

The *Analyzer Level* table section sets the maximum input level that can be measured. Two alternative *RF Modes* for defining this value are provided:

Manual	Manual input of maximum input level. Open loop power control of the mobile is deactivated and the mobile is commanded to transmit at the fixed output power set in the *RF Max. Level* field.
Auto	Automatic setting of maximum input level *(autoranging)* according to the expected power of the MS transmitter output signal. The MS estimates its output power according to the open loop condition, so that the sum of the mean input power (corresponding to the *CDMA Power* set in the *BS Signal* tab) and the mean output power (the so-called Power Offset) remains constant. According to standard TIA/EIA/IS-2000.2-A, the Power Offset depends on the MS band class, the forward and reverse spreading rate, and the Radio Configuration of the reverse channels.

Remote control
`[SENSe:]LEVel:MODE  MANual | AUTomatic`

Analyzer Level – RF Max. Level

RF Max. Level defines a fixed value for the mean output power of the MS. The setting takes effect as when the *RF Mode* is changed to *Manual*. *RF Max. Level* also determines the expected power at the RF Input connector.

Remote control
`[SENSe:]LEVel:MAXimum <Level>`

External input attenuation

The range of *RF Max. Level* values depends on the RF input used. If an external input attenuation is reported to the instrument to compensate for a known path loss (see section *AF/RF Connectors (Connection Control – AF/RF)* in the CDMA Non-Signalling section), all levels measured are referenced to the output of the DUT and therefore shifted with respect to the actual level at the input connectors of the CMU. The level ranges for the input connectors are shifted as well.

Error messages

If the *RF Max. Level* is too high or too low, a window with the error message "*<Max_Level> is out of range. <permissible max. value> is limit.*" and three fields will appear:

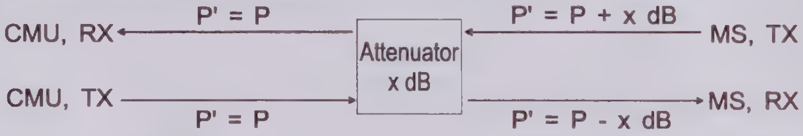
Accept	The permissible max. value is accepted as *RF Max. Level*,
Re-edit	*RF Max. Level* is entered once again,
Cancel	The last valid input value is maintained.

When switching over to another input, the current value of *RF Max. Level* is automatically adapted, if required:

- Towards lower values to the maximum value of the new input,
- Towards upper values to the minimum value of the new input.

Symmetric input/output attenuation

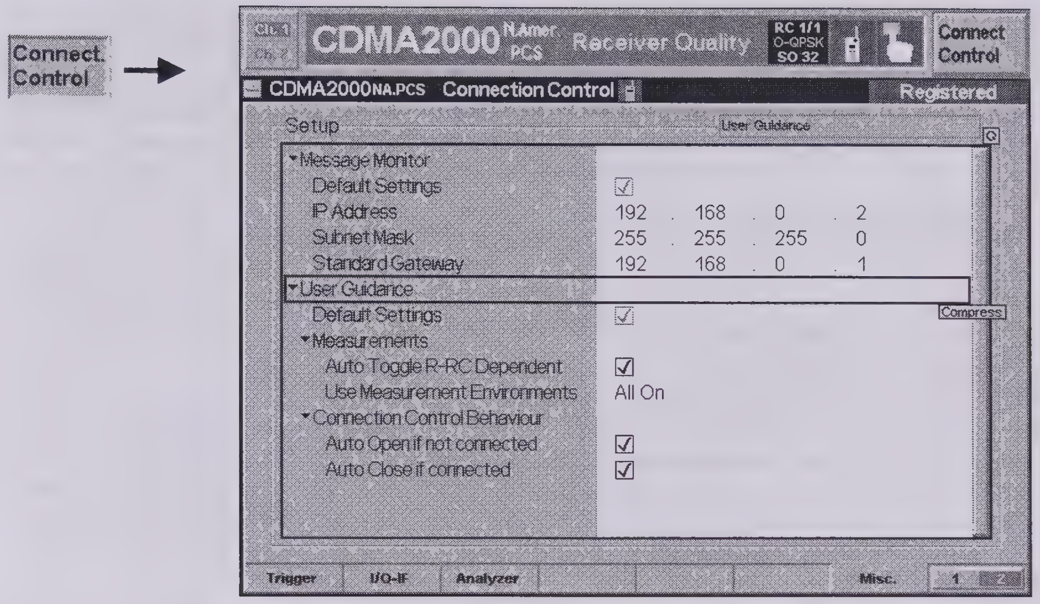
If the MS output power is controlled according to the open loop condition (mean input power + mean output power = constant Power Offset; see *RF Mode – Auto* setting above), an additional attenuation affecting both the forward and reverse path will not change the power measured at the RF input of the CMU:



Analogously, changing the values of *Ext. Att. Output* and *Ext. Att. Input* by the same amount has no influence on the measured RF input power at the CMU. It is nevertheless recommended to set the correct external input and output attenuation factors in order to obtain well-defined levels throughout the entire test setup.

Miscellaneous User Settings (Connection Control – Misc.)

The popup menu *Misc.* defines the trigger source and miscellaneous user settings.



▾Message Monitor	
Default Settings	☑
IP Address	192 . 168 . 0 . 2
Subnet Mask	255 . 255 . 255 0
Standard Gateway	192 168 . 0 . 1
▾User Guidance	
Default Settings	☑
▾Measurements	
Auto Toggle R-RC Dependent	☑
Use Measurement Environments	All On
▾Connection Control Behaviour	
Auto Open if not connected	☑
Auto Close if connected	☑

Figure 4-70 Connection Control – Misc. Settings

Message Monitor

The *Message Monitor* section defines the address information necessary for connecting the *Message Monitor* installed on a PC to the CMU. The *Message Monitor* is an optional accessory for the CDMA200 options (option CMU-B87, *Message Monitor for CDMA2000 Signalling Units CMU-B83)* to capture, interpret, and display the CDMA forward and reverse link messages exchanged between a CMU200 and a mobile station.

For more information refer to the separate CMU-B87 operating manual, stock no. 1007.9616.32.

IP Address	IP address of the CMU
Subnet Mask	Subnet Mask address of the CMU
Standard Gateway	Gateway address of the CMU

Remote Control

```
CONFigure:MMONitor:IPADdress
<IP Address 1>, <IP Address 2>, <IP Address 3>, <IP Address 4>
CONFigure:MMONitor:SMASk
<Subnet Mask 1>, <Subnet Mask 2>, <Subnet Mask 3>, <Subnet Mask 4>
CONFigure:MMONitor:SGATeway
<Gateway 1>, <Gateway 2>, <Gateway 3>, <Gateway 4>
```

User Guidance – Measurements

The *User Guidance* section provides settings to control the automatic switchover between menus of the user interface and between measurement environments.

Default Settings Returns all *User Guidance* settings to their default values.

Auto Toggle R-RC Dependent

Auto Toggle (if checked) automatically selects the correct measurement modulation scheme (O-QPSK or H-PSK) according to the Reverse Radio Configuration.

Use Measurement Environments

Specifies how the individual measurement environments are used (see Chapter 3). *All On* causes the measurement environments to be activated as soon as a connection is established and the measurement is switched on. *All Off* disables all measurement environments so that the *Connection Control* parameters are used permanently. *Some On* is indicated if some but not all of the individual measurement environments have been enabled.

Remote control No command for *Auto Toggle R-RC Dependent.*
`CONFigure:ALL:ENVironment:ENABle[?]` *`<Enable>`*

User Guidance – Connection Control Behavior Defines in what instances the *Connection Control* popup menu is automatically opened or closed:

Open autom. if not connected

In the *Open automatically* mode, the *Connection Control* menu is automatically opened each time the GSM function group is accessed in *Signalling* test mode, each time a measurement menu is opened while the DUT is not connected and each time a connection is lost. Otherwise the menu must be opened manually.

Close autom. if connected

In the *Close automatically* mode, the *Connection Control* menu is automatically closed as soon as the CMU reaches the *Connected/Call Established* state. Otherwise the menu must be closed manually.

Remote control No command; screen configuration only.

Marker Control

Markers are references available with any application displaying a graph of the measurement. This section gives a detailed explanation of how to control each marker type. Marker information specific to an application is located with the application.

Marker

The *Marker* softkey positions up to three markers and a D-line in the test diagram and reads their values.

Markers	Graphical tools for marking points on the measurement curve and for numerical output of measured values. The markers are turn activated by pressing the hotkey and pressing the *ON/OFF* key, or entering a value. Values can be entered directly with the keypad or with the *Variation* knob. The coordinates of the three markers are indicated in the format *Ordinate value (level)/abscissa value (time)* in a parameter line above the test diagram. The position of the reference marker is expressed in absolute units (level in dBm or percentage and time in symbols). The delta markers are expressed as absolute or relative values (relative position from the reference marker).
D-Line	The D-Line is a horizontal line that can be positioned to mark and read out an arbitrary level in the test diagram.

Ref R

The *Ref* R hotkey displays the status (On | Off) of the reference marker. Pressing the hotkey displays a popup menu to switch the reference marker on or off (use the *ON/OFF* key or the *Variation* knob).

The reference marker is represented by the symbol R in the test diagram. The marker position (abscissa) is determined in the input field *Ref. Marker*. The marker can be positioned to arbitrary time values. If its position is outside the diagram area it will be invisible and its coordinates will be "- - - / <abscissa_value>". The marker is switched off in the default setting *(OFF)*. The marker level is defined by the measurement curve at the marker position.

Delta R

The *Delta* 1 hotkey displays the status (On | Off) of delta marker 1. Pressing the hotkey displays a popup menu to switch the delta marker 1 on or off (use the *ON/OFF* key or the *Variation* knob).

Delta marker 1 is represented by the symbol 1 in the test diagram. The marker position (abscissa) is defined in the input field *Delta Marker 1*. The marker can be positioned to arbitrary time values. If its position is outside the diagram area it will be invisible and its coordinates will be "<abscissa_value> / - - -". The marker is switched off in the default setting *(Off)*. The marker level is defined by the trace at the marker position.

Pressing the hotkey twice displays the *Delta 1 Config* popup display. It defines whether the position of delta marker 1 is measured and indicated in absolute units (of the horizontal scale) or relative to the reference marker.

Delta 2

The *Delta* 2 hotkey switches the delta marker 2 on or off (use the *ON/OFF* key).

The functions and control are identical to delta marker 1.

D-Line

The *D-Line* hotkey activates and controls the position of the D-Line in the test diagram.

The D-line is a horizontal, colored auxiliary line in the test diagram used for marking a level value and for measuring level differences.

Press the hotkey once to turn the D-Line on or off (using the *ON/OFF* key). The level of the D-line is determined by entering an absolute or relative value with either the keypad or *Variation* knob.

Press the hotkey twice to open the *D-Line Config* popup to set the absolute or relative D-Line display.

In the Absolute setting, the D-Line is expressed in the vertical scale units and is limited to the value range of the vertical scale. In the Relative setting, the D-Line value is relative to the maximum vertical scale.
The default setting is Off.

Audio Measurements and Setup

The Audio function group provides two measurement functions:

- Analyzer measurements and Generator settings
- Multitone audio measurements

To perform Speech measurements, the *Speech Service* class must be selected and the *Voice Coder* set to 8k / 8k (Low) (Service Option 1) or 8k Enhanced / 8k Enhanced (Low) (Service Option 3) or 13k / 13k (Low) (Service Option 17). The Primary Service Class is configured in the *Connection* tab (see *1st Service Class* softkey on p. 4.37) and the *Voice Coder* is configured in the *Service Cfg.* tab (see section *Speech Service* on p. 4.111 ff.), both located in the *Connection Control* menu. The routing of the speech encoder and decoder is defined in the *AF/RF Connector* tab; see section *AF/RF Connectors (Connection Control – AF/RF)* on p. 4.138 ff.

Refer to the CMU200 operating manual for complete details of the use of the audio measurement function group and measurement setup.

The following three figures contain block diagrams illustrating the setup and signal flow when using the *Speech Coder* option CMU-B85.

- *Figure 4-71* illustrates signal flow through the Speech Coder.
- *Figure 4-72* illustrates the setup to test audio via the forward link.
  Setting *Speech Encoder* to Generator
  Setting *Speech Decoder* to Handset
- *Figure 4-73* illustrates the setup to test audio via the reverse link.
  Setting *Speech Encoder* to Handset
  Setting *Speech Decoder* to Analyzer

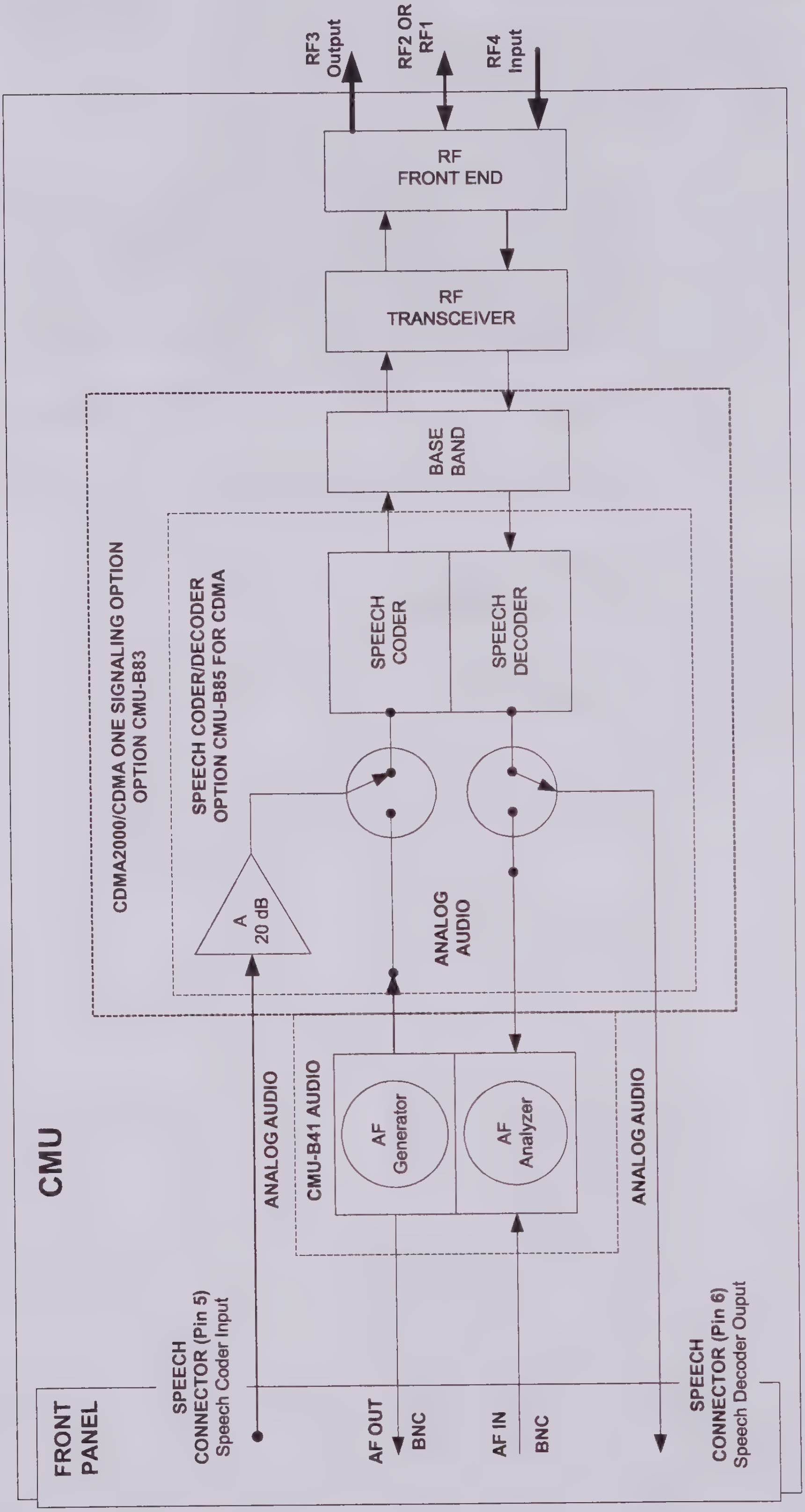


Figure 4-71 Speech Coder Signal Flow

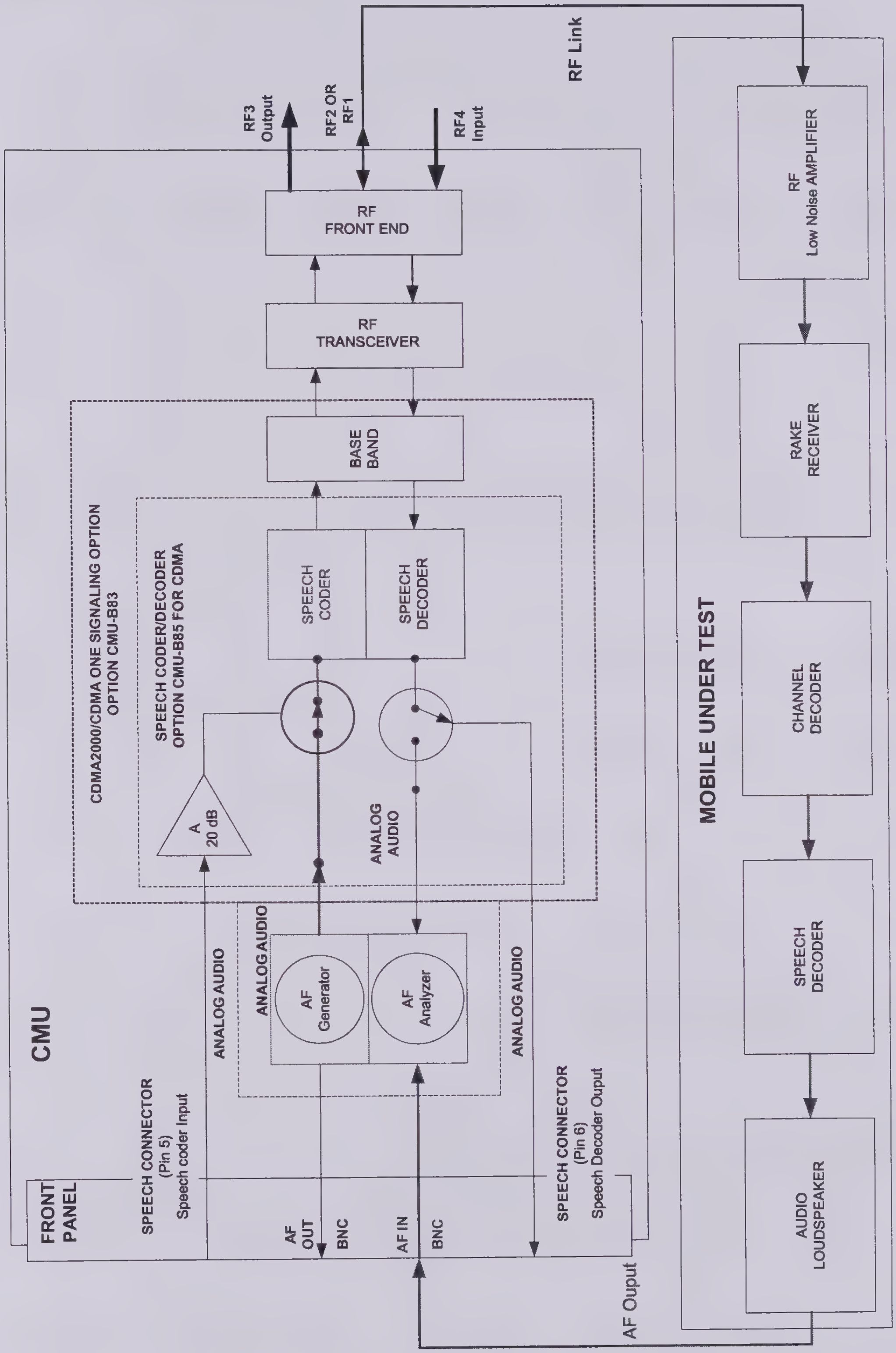


Figure 4-72 Forward Link Audio Test Setup

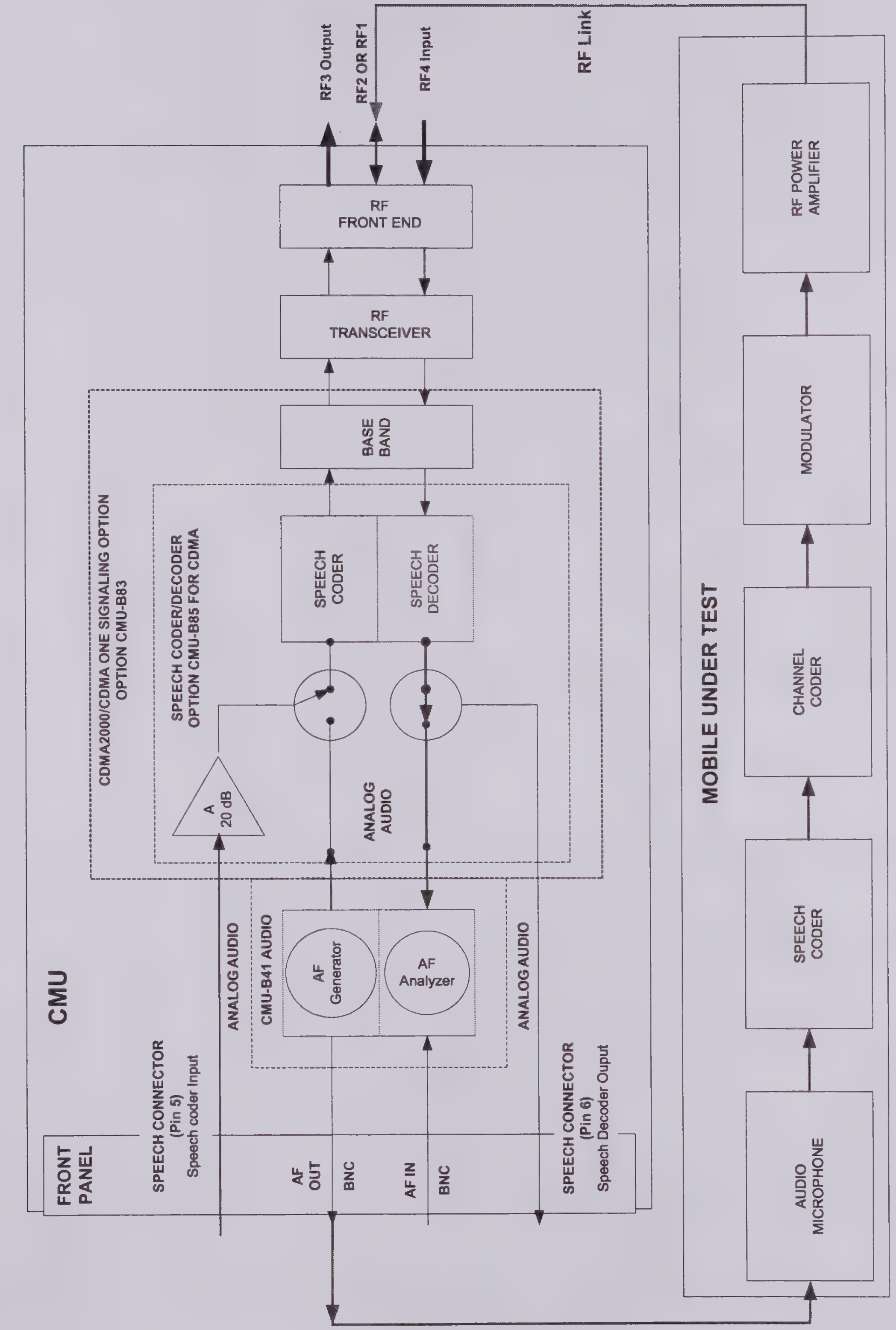


Figure 4-73 Reverse Link Audio Test Setup

Setting Up an IP Connection

The R&S CMU supports Service Option 33, which CDMA2000 mobiles can use to request packet data service through a serving node supporting an Internet standard Point-to-Point Protocol (PPP) interface to network layer protocols. Configuration of Service Option 33 is described in section *Packet Data Service* on p. 4.119 ff.

The packet data service provides a basic IP connection between a mobile and the base station/CMU. With a mobile supporting a data connection via a cable to a PC, a typical test setup could look as follows:

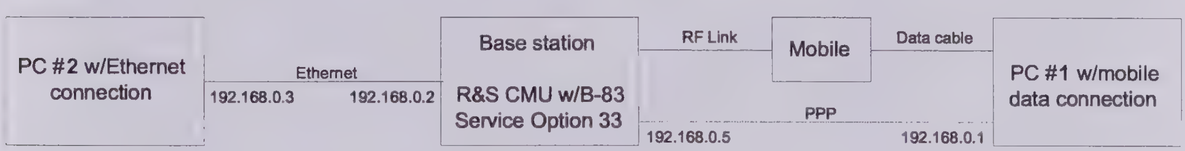


Figure 4-74 Test setup for packet data services

The RF link between the mobile and the CMU/base station plus the data cable link to PC#1 are equivalent to a point-to-point connection between the CMU and the PC#1. The R&S CMU is equipped with an internal 250 kbyte FTP server that can be addressed using the *BS PPP IP Address* set in the *Service Cfg.* tab. With this feature, it is possible to directly address the CMU, e.g. to:

- Send a ping to the internal FTP server.
- Transfer data from and to the internal server using FTP.

Alternatively, it is possible to connect the CMU to a second external PC#2 using the Ethernet connection of option R&S CMU-B87 (Message Monitor). With this extended test setup, the CMU can be used as an IP interface to the mobile, e.g. to:

- Analyze IP traffic from the mobile at PC#2.
- Open an FTP session between PC#1 and an external FTP server running on PC#2, avoiding the restrictions of the CMU's internal FTP server.
- Configure PC#2 as a web server and test web applications.

Setting up a Packet Data Connection

In most cases a packet data connection must be initiated from the mobile using a specific control software on PC#1. Before doing so, it is recommended to set the following parameters in the *Service Cfg.* tab of the *Connection Control* menu (see section *Packet Data Service* on p. 4.119 ff.):

1. Assign a *BS PPP IP Address* to the CMU, e.g. 192.168.0.5.

This IP address will be valid for the duration of the connection and can be requested from the PC.

2. In the *Packet Data Service* section, select the data rates for the forward and reverse link according to your application (e.g. asymmetric data rates for file transfer in one direction).

Packet Data Service is activated automatically when the connection is set up.

Ping

This application requires a point-to-point connection between the CMU and the PC#1 (right-hand side of Figure 4-74). No additional PC # 2 is required. Ping is an application with equal traffic in the forward and the reverse link.

Command Line

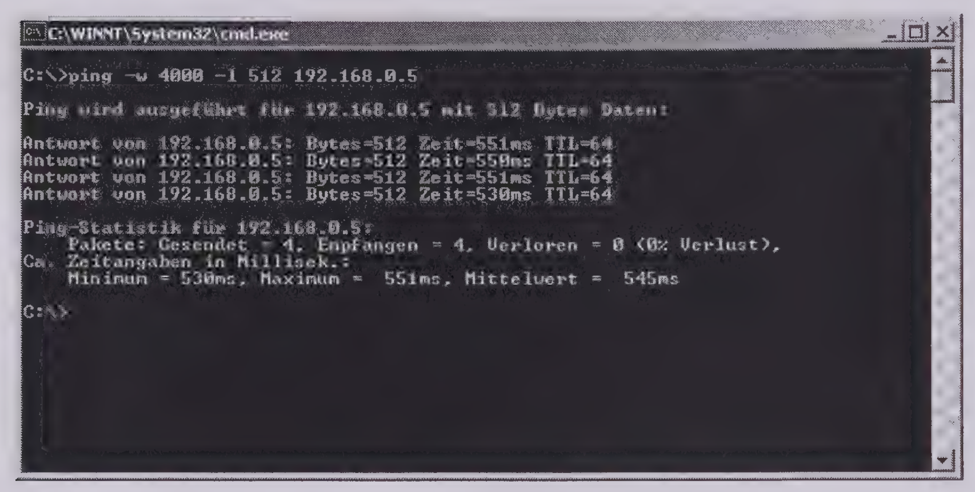
➢ To send a ping to the CMU use the following command line syntax:

`ping -w 4000 -l 512 192.168.0.5 -t`

where:

-w	number of milliseconds to wait for response
-l	byte length of echo request
192.168.0.5	example CMU PPP IP address
-t	if present, continues sending echo packets

Example



```
C:\>ping -w 4000 -l 512 192.168.0.5

Ping wird ausgeführt für 192.168.0.5 mit 512 Bytes Daten:

Antwort von 192.168.0.5: Bytes=512 Zeit=551ms TTL=64
Antwort von 192.168.0.5: Bytes=512 Zeit=550ms TTL=64
Antwort von 192.168.0.5: Bytes=512 Zeit=551ms TTL=64
Antwort von 192.168.0.5: Bytes=512 Zeit=530ms TTL=64

Ping-Statistik für 192.168.0.5:
    Pakete: Gesendet = 4, Empfangen = 4, Verloren = 0 (0% Verlust),
Ca. Zeitangaben in Millisek.:
    Minimum = 530ms, Maximum =  551ms, Mittelwert =  545ms

C:\>
```

Internal FTP Server

This application requires a point-to-point connection between the CMU and the PC#1 (right-hand side of Figure 4-74). No additional PC # 2 is required. The connection allows to directly test the upload and download speed, e.g. at different asymmetrical data rates in the forward and reverse link.

FTP Server Characteristics

The internal FTP server of the CMU has a size of 250 kbyte and can be addressed using the *BS PPP IP Address* set in the *Service Cfg.* tab. The server contains three standard test files of different size (2 kbyte, 20 kbyte and 200 kbyte). The server is cleared and the test files are re-loaded during each startup procedure of the CMU.

Command Line

Anonymous FTP access to the internal server is allowed using the username ‘ftp’ with password ‘ftp’.

1. To connect to the server use the following command line syntax:

   `ftp://ftp.192.168.0.5`

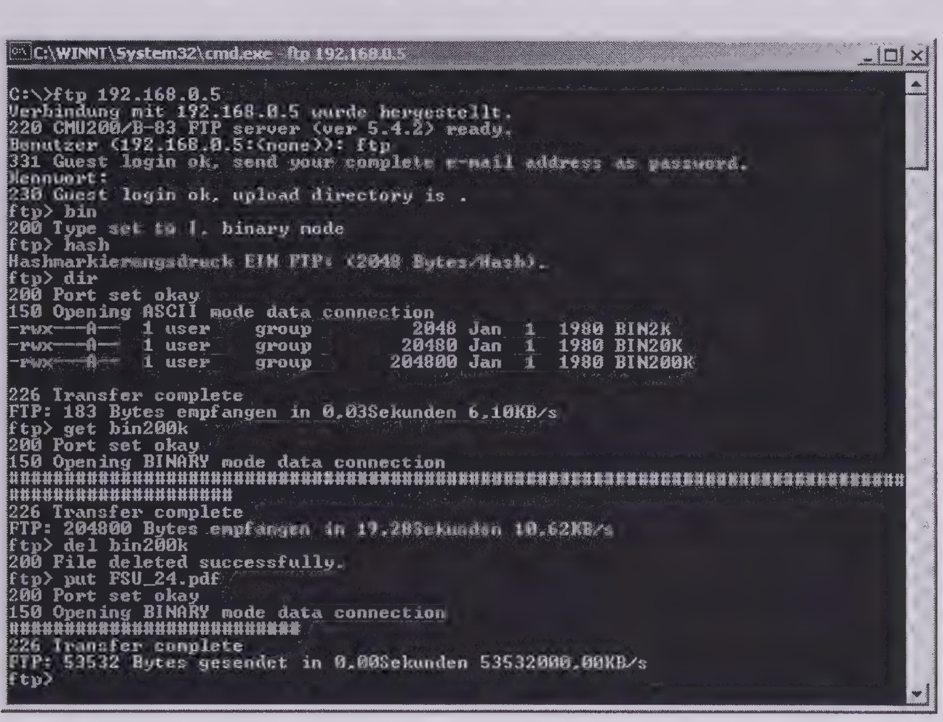
   user: `ftp`

   password: `ftp`

2. Use the following commands:

dir	show files
hash	displays progress
get bin200k	download a file
quit	close the FTP session

Example



```
C:\>ftp 192.168.0.5
Verbindung mit 192.168.0.5 wurde hergestellt.
220 CMU200/B-83 FTP server (ver 5.4.2) ready.
Benutzer (192.168.0.5:(none)): ftp
331 Guest login ok, send your complete e-mail address as password.
Kennwort:
230 Guest login ok, upload directory is .
ftp> bin
200 Type set to I, binary mode
ftp> hash
Hashmarkierungsdruck EIN FTP: (2048 Bytes/Hash).
ftp> dir
200 Port set okay
150 Opening ASCII mode data connection
-rwx---A--   1 user    group          2048 Jan  1  1980 BIN2K
-rwx---A--   1 user    group         20480 Jan  1  1980 BIN20K
-rwx---A--   1 user    group        204800 Jan  1  1980 BIN200K

226 Transfer complete
FTP: 183 Bytes empfangen in 0,03Sekunden 6,10KB/s
ftp> get bin200k
200 Port set okay
150 Opening BINARY mode data connection
################################################################################
####################
226 Transfer complete
FTP: 204800 Bytes empfangen in 19,28Sekunden 10,62KB/s
ftp> del bin200k
200 File deleted successfully.
ftp> put FSU_24.pdf
200 Port set okay
150 Opening BINARY mode data connection
##########################
226 Transfer complete
FTP: 53532 Bytes gesendet in 0,00Sekunden 53532000,00KB/s
ftp>
```

Data Traffic

The data traffic to and from the CMU can be observed in the *Code Domain Power* menu:

- When a file is transferred from the PC#1 to the internal FTP server (FTP upload), the bar graphs in the *Code Domain Power* show active reverse traffic channels (FCH and SCHs, if the latter are enabled).
- When a file is transferred from the internal FTP server to the PC#1 (FTP download), the bar graphs in the *Code Domain Power* show temporary activity in the reverse traffic channels, which is due to the exchange of signalling messages. The forward channels are not visualized in the *Code Domain Power* menu.

IP Connection with external PC

With an additional second PC#2 (left-hand side of Figure 4-74) connected through the Ethernet connection of option R&S CMU-B87 (Message Monitor), the CMU can be used as an IP interface to the mobile. Assuming that the Ethernet PC address of PC#2 is 192.168.0.3, the CMU Ethernet IP address is 192.168.0.2, and the mobile's PPP IP address is 192.168.0.1, enter the following commands on the PC #2:

```
route delete 192.168.0.0
route add 192.168.0.0 mask 255.255.0.0 192.168.0.2
```

The two PCs PC#1 and PC#2 should now be able to see each other and use network services and applications such as Ping, FTP, and HTTP.

E.g., with an FTP server running on PC#2, it is possible to open an FTP session from PC#1 using the command line:

```
ftp://ftp.192.168.0.3
```

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5 Remote Control – Basics

This chapter gives a survey of the basic features and concepts of CDMA2000 remote control commands. Remote control can be described in terms analogous to the ones used in Chapter 3 for the classification of menus and settings for the graphical user interface. In the following, we will particularly point out the similarities and differences between manual and remote control.

Structure and Order of Commands

Chapter 6 of this manual gives a description of all CDMA2000 remote control commands, including their parameters, default values and ranges of all numerical parameters.

Function groups and test modes

Commands for the various CDMA-MS function groups are largely identical, however, the ranges of numerical values and some default settings may differ. All differences are explicitly quoted for each function group.

Commands for the two modes *Signalling* and *Non-Signalling* are listed separately although many of them have the same syntax. The commands for the measurement groups `WPOWer` and `NPOWer` and several general-purpose commands are identical in both test modes, so they are reported only once (see section *Common Measurements and Command Groups).*

Addressing

The CMU200 uses extended addressing. The instrument is assigned a primary address while each function group and test mode is identified via a secondary address. This allows the same remote commands to be used in several function groups and modes:

```
ibwrt(h_CDMA_Cell_MS_SIG, "INITiate:POWer")
ibwrt(h_CDMA_PCS_MS_SIG, "INITiate:POWer")
ibwrt(h_CDMA_PCS_MS_NSIG, "INITiate:POWer")
```

provided that the variables `h_CDMA_Cell_MS_SIG, etc.` have been appropriately defined, see program examples in Chapter 7 of the CMU Operating manual.

The remote control commands for first `(SYST:COMM:GPIB:ADDR)` and secondary `(SYST:REM:ADDR:SEC)` addressing are described in the CMU Operating manual. The `SYST:REM:ADDR:SEC` command uses the following names to address the GSM network tests described in this manual:

CDMA2K450MS_NSig	*CDMA2K450MS_Sig*
CDMA2KCellMS_NSig	*CDMA2KCellMS_Sig*
CDMA2KPCSMS_NSig	*CDMA2KPCSMS_Sig*
CDMA2KIMT2KMS_NSig	*CDMA2KIMT2KMS_Nig*

Order of commands The commands are arranged to form groups belonging to the same measurement or to the same type of configurations. These command groups are identified by the second-level keyword (as in `POWer`). Applications belonging to a measurement group (see Chapter 5 of the CMU200 operating manual) are identified by the third-level keyword of each command (as in `MODulation: EVMagnitude`). Chapter 6 is organized as follows:

CDMA2000 Non-Signalling:

- General configurations (second-level keywords `NSTandard, LEVEL, INTernal, EXTernal, RFANalyzer, RFGenerator, INPut, OUTPut, CORRection:LOSS, DM:CLOCk`)
- Measurement groups: `MODulation`

Common command and measurement groups (identical in Non Signalling *and* Signalling *mode:*

- General purpose commands `(OPTion, RESet, STATus:OPERation, IQIF)`
- Measurement groups `(WPOWer, NPOWer)`

CDMA2000 Signalling:

- General configurations and signalling (`NSTandard, LEVel, INTernal, SIGNalling, HANDoff, BSSignal, NETWork, INPut, OUTPut, CORRection:LOSS, DM:CLOCk`).
- Measurement groups: (second/third-level keywords `MSSinfo, SAPPower, OVERview:POWer, OVERview:MODulation, OVERview:CQUality, POWer:OLTResponse, POWer:MIOutput, POWer:MAOutput, POWer:GOUTput, MODulation:OVERview, MODulation: EVMagnitude, MODulation:PERRor, MODulation:MERRor, SPECtrum:ACP, CDPower…, RXQuality…`).

The structure of Chapter 6 differs from Chapter 4 *(Functions and their Application)* where the measurements are presented first and configurations pertaining to the whole function group and test mode are reported at the end of each section.

The menu of the graphical user interface corresponding to a group of commands is quoted at the beginning of each section. Alphabetical lists of all commands are annexed to Chapter 6.

SCPI Conformity In view of the particular requirements of CDMA measurements not all commands could be taken from the SCPI standard. However, the syntax and structure of all commands is based on SCPI conventions. For a detailed description of the SCPI standard refer to Chapter 5 of the operating manual for the CMU basic unit.

SPCI confirmed and SPCI approved commands are explicitly marked in Chapter 6.

Remote Control All commands may be used for control of the CMU via the GPIB interface or serial (RS-232) interface.

Measurement Control

The commands in the measurement groups `WPOWer`, `NPOWer`, `POWer...`, `MODulation...`, `SPECtrum...` `CDPower...`, and `RXQuality...` have an analogous structure and syntax. The measurements are controlled according to common concepts which are explained in detail in Chapter 5 of the CMU operating manual. The following sections show how the general concepts are applied to CDMA measurements.

Measurement Groups

The measurement groups are referred to as *measurement objects* (keyword <meas_obj>) in remote control. Most measurement objects correspond to a measurement group or application in manual control. For CDMA2000 measurements, the following measurement objects are defined:

Table 5-1 Measurement objects in the Signalling and Non-Signalling Mode

Non Signalling		**Signalling**	
Meas. Object	**Measurement group / Application**	**Meas. Object**	**Measurement group / Application**
`WPOWer`	*Wideband Power* softkey (wide-band peak power measurement).	`WPOWer`	*Wideband Power* softkey (wide-band peak power measurement).
`NPOWer`	Narrow-band power NPower, included in the *Power* menu.	`NPOWer`	Narrow-band power NPower, included in the *Power* menu.

`MODulation:MQUality[:OQPSk]`
`MODulation:MQUality:HPSk`
`MODulation:MQUality:QPSK`
	Mod. Qual. 0-QPSK
	Mod. Qual. H-PSK
	Mod. Qual. QPSK
	MS power, waveform quality, frequency error, transmit time error, carrier feedthrough, I/Q imbalance and sideband suppression for different modulation schemes. Statistical results and the results of the limit check can be evaluated.
		`OVERview:OVERview[:OQPSk]`
		`OVERview:OVERview:HPSK`
		`OVERview:CQUality`
		`OVERview:PPOWer`
			Overview QPSK
			Overview HPSK
			Channel Quality
			Pilot Power Report
			MS power, waveform quality, frequency error, transmit time error, carrier feedthrough, I/Q imbalance and sideband suppression for different modulation schemes. Statistical results and the results of the limit check can be evaluated.

		`POWer:MIOutput[:OQPSk]`
		`POWer:MIOutput[:HPSK]`
		`POWer:MAOutput[:OQPSk]`
		`POWer:MAOutput[:HPSK]`
		`POWer:MAOutput:OLTResponse`
			Min. Output O-QPSK
			Max. Output O-QPSK
			Min. Output H-PSK
			Max. Output H-PSK
			Open Loop Time Resp.
			Gated Output
			Minimum and maximum MS transmitter output power and MS output power as a function of time in various MS operating modes.

Non Signalling		Signalling	
Meas. Object	**Measurement group / Application**	**Meas. Object**	**Measurement group / Application**

		`MODulation:OVERview[:OQPSk]`
		`MODulation:OVERview:HPSK`
		`MODulation:EVMagnitude[:OQPSk]`
		`MODulation:EVMagnitude:HPSK`
		`MODulation:MERRor[:OQPSk]`
		`MODulation:MERRor:HPSK`
		`MODulation:PERRor[:OQPSk]`
		`MODulation:PERRor:HPSK`
			Overview O-QPSK
			Overview H-PSK
			EVM O-QPSK
			EVM H-PSK
			Magn. Err. O-QPSK
			Magn. Err. H-PSK
			Phase Err. O-QPSK
			Phase Err. H-PSK
			Modulation waveform interval as a function of time (phase error, error vector magnitude, magnitude error) of the MS transmitter output signal.
			The frequency error, average and RMS error, statistical results and the results of the limit check can be evaluated.

		`SPECtrum:ACP`	*ACP* Off-carrier power at four symmetrical pairs of offset frequencies and limit check.

		`CDPower:CDPW`
		`CDPower:PCDep`
		`CDPower:CHPW`
			CDP H-PSK
			PCDEP H-PSK
			Ch. Power H-PSK
			Code domain power, peak code domain error and channel power of the MS transmitter output signal.
			The MS power, carrier feedthrough, frequency error and rho factor, statistical results and the results of the limit check can be evaluated.

		`RXQuality:FER:FCH`
		`RXQuality:FER:SCHScch`
		`RXQuality:FER:FPControls`
			FER FCH
			FER SCH/SCCH
			Fwd. Power Control
			Frame error rate and forward power control reported by the mobile station.
			Statistical results and the results of the limit check can be evaluated.

The measurement objects in Table 5-1 are complemented by groups of commands used to retrieve results that are automatically provided by the mobile station (e.g. the receiver parameters reported by the mobile phone). These command groups consist of queries only and do not represent real measurement objects. For an overview, see the list of remote control commands at the end of Chapter 6.

Measurement Statistics

Together with the *Statistic Count*, the *Repetition Mode* defines how many evaluation periods are measured if the measurement is not stopped explicitly (measurement control commands `STOP...`, `ABORT...`) or by a limit failure. With remote control, the two repetition modes *Single Shot and Continuous* are available (*Counting* is not available in manual control, see chapter 3).

Generally four different traces are determined within one measurement:

- The result in the current period
- The maximum result
- The minimum result
- The average result (evaluated over a set number of waveform intervals)

The four results can be queried independently.

Table 5-2 Repetition mode in remote control

Setting	Description	Command

Statistic Count	Integer number of evaluation periods forming one statistics cycle. An evaluation period is equal to a burst `(POWer |` `MODulation)` or a frame (`RXQuality`).
	In an RXQuality:FER measurement, the STATistics parameter denotes the number of frames to be averaged per iteration step (search cycle).
		`CONFigure:<meas_obj>:CONTrol:STATistics` `1 ... 1000 | NONE`
		`(<meas_obj> = OVERview | POWer... |` `MODulation... | SPECtrum... | CDPower...)`
		`CONFigure:RXQuality:FER:TSETup<nr>:CONTrol:` `FRAMes 1 ... 10000`

Repetition Mode Single Shot	The measurement is stopped after one statistics cycle. All remote control measurements default to single shot.	`CONFigure:<meas_obj>:CONTrol:REPetition` `SINGleshot, <StopCondition>, <Stepmode>` `(<meas_obj> = OVERview... | POWer... |` `MODulation... | SPECtrum... | CDPower... |` `RXQuality...)`
Continuous	The measurement is continued until stopped explicitly or by a limit failure. Average results are calculated according to the rules described in chapter 3.	`CONFigure:<meas_obj>:CONTrol:REPetition` `CONTinuous, <StopCondition>, <Stepmode>` `(<meas_obj> = OVERview... | POWer... |` `MODulation... | SPECtrum... | CDPower... |` `RXQuality...)`
Counting	Repeated single shot measurement with configured statistics cycles.	`CONFigure:<meas_obj>:CONTrol:REPetition` `1 ... 10000, <StopCondition>, <Stepmode>` `(<meas_obj> = OVERview... | POWer... |` `MODulation... | SPECtrum... | CDPower... |` `RXQuality...)` A counting measurement with 1 evaluation period is equivalent to a single shot measurement..

Traces	The specifiers `CURRent, MMAX,` and `AVERage` denote the traces for the current evaluation period, the extreme value, and the average of a set of evaluation periods. They correspond to the *Display Mode* set in the measurement configuration menus.
	In general all four traces are evaluated during the measurement. They are selected via the specifiers used as last keywords in the `READ..., FETCh...` or `SAMPle...` queries.
		Measurement results:
		`READ:ARRay:<meas_obj>:<disp>?`
		`READ:SUBarrays:<meas_obj>:<disp>?`
		`...`
		`<disp> = CURRent | AVERage | MAXimum |` `MINimum | MMAX` (not all modes are available for all measurements)
		`<meas_obj> = POWer:GOUTput | CDPower... |` `MODulation:EVMagnitude... |` `MODulation:PERRor... | MODulation:MERRor...`
		Limit matching:
		`CALCULATE[:SCALar]:<meas_obj>:<disp>:` `MATChing:LIMit? <Response>`
		....
		`<Response>` contains the limit matching identifiers for all three traces

Specifying Limits

The following table gives an overview of the types of limits and possible results of the limit check.

Table 5-3 Limits and limit check

Type	**Description**	**Command**

Scalar limits	Limit values for a single (scalar) measured quantity. Depending on the measured quantity, either an upper limit or upper and lower limits can be defined.	`CONFigure:<meas_obj>:<disp>:LIMit [:SCALar]:<symmetry>:<Spec.>:VALue`
		`<disp> = CURRent | AVERage | MMAX | CAMMax`
		where CAMMax denotes a limit valid for all measurement curves (current and average and min/maximum)
		`<meas_obj> = OVERview... | POWer... | MODulation...`
		`<symmetry> = SYMMetric | ASYMmetric`
		for symmetric or asymmetric upper and lower limits
		`<Spec.> = UPPer | LOWer | [:COMBined]`
		for upper limits, lower limits, or combined upper and lower limits.
		`CONFigure:RXQuality:FER:TSETup<nr>:LIMit[ :SCALar]:SYMMetric[:COMBined]:VALue`

Limit lines	For Gated Output Power, a tolerance template consisting of several areas can be defined.	`CONFigure:POWer:GOUTput:CAMMax:LIMit :<Area>:VALue`
Limit check	All scalar limits belonging to the same measurement group are read out together with the command on the right side.	`CALCulate:<meas_obj.>:MATChing:LIMit?`
	Possible results of the scalar limit check are listed on the right side.	`NMAU` not matching, underflow `NMAL` not matching, overflow `INV` measured value invalid `OK` no limit failure

	The result of the limit check depends on the statistics settings (see section Measurement Statistics on page 5.4).	`CALCULATE:ARRay:<meas_obj>:<disp> :MATChing:LIMit?`
		`....`
		where `<disp> = :CURRent | :AVERage | | :MMAXimum | :MAXimum | :MINimum`

Measurement Environments

The measurement environments described in Chapter 3 can be activated or deactivated by means of the following commands:

- `CONFigure:<meas_obj>:ENVironment:ENABle ON | OFF` enables or disables the environment of the corresponding measurement or measurement application.
- `CONFigure:ALL:ENVironment:ENABle ON | OFF` enables or disables all measurement environments. With disabled environments, the *Connection Control* parameters are used permanently.

The parameters of the individual measurement environments are set using commands of the type `CONFigure:<meas_obj>:ENVironment…`

Status Reporting System

A general description of SCPI status registers and of the status reporting system is given in Chapter 5 of the CMU operating manual. This section is devoted to the particular features concerning CDMA2000 measurements.

The CMU offers 30 independent `STATus:OPERation:SUM1|2:CMU<nr>` sub-registers (<nr>=1 ... 15) which are implemented in hierarchical form. The bits of the 30 STATus:OPERation registers are set only after the registers are assigned to a function group and measurement mode.

In the EVENt part, the STATus:OPERation register contains information on which actions the instrument has executed since the last readout. All fife parts of the registers can be read using one of the commands of the subsystem `STATus:OPERation:SUM1|2:CMU<nr>:...`

Note: *Symbolic status register evaluation by means of the commands `STATus:OPERation:SYMBolic:ENABle` and `STATus:OPERation:SYMBolic[:EVENt]?` is a convenient alternative method of retrieving status information. See also section* Symbolic Status Event Register Evaluation *in chapter 5 of the CMU operating manual and chapter 6 of this manual.*

CDMA mobile tests comprise the two signalling modes *Non-Signalling* and *Signalling* for the CDMA2000 function groups so that a total of 2 secondary addresses are used. In the two status registers for the *Non-Signalling* mode the bit assignment is as follows:

Table 5-4 Non-Signalling bits used in the STAT:OPER:SUM1|2:CMU<nr> sub-registers

Bit-No.	Description	Symbol in `STAT:OPER:SYMB...`
4	**Measurement Invalid** This bit is set if the active measurement could not performed and terminated correctly (e.g. because of a low signal level) so that the measurement results are invalid.	**MINV**
11	**RF Input Overdriven** This bit is set if the RF input level at connector RF1, RF2 or RF 4 IN is larger than the specified *RF Max. Level* plus an appropriate margin.	**RFIO**
12	**RF Input Underdriven** This bit is set while the RF input level at connector RF1, RF2 or RF 4 IN falls below the measurement range controlled by the specified *RF Max. Level.*	**RFIU**

In the two status registers for the *Signalling* mode the bit assignment is as follows:

Table 5-5 Signalling bits used in the STAT:OPER:SUM1|2:CMU<nr> sub-registers

Bit-No.	Description	Symbol in `STAT:OPER:SYMB...`
0	**Call from Mobile** This bit is set when the CMU receives a call from the mobile under test.	CFM
1	**Release from Mobile** This bit is set when the connection to the mobile is being released.	RFM
2	**Loss of Radio Link** This bit is set if the CMU had to leave the signalling state "Connected" (because of a low signal etc.).	LORL
3	**Mobile Registered** This bit is set when a registration was successfully performed.	MREG
4	**Measurement Invalid** This bit is set if the active measurement could not performed and terminated correctly (e.g. because of a low signal level) so that the measurement results are invalid.	MINV
6	**Reference Frequency not synchronized** This bit is set if the reference frequency is not synchronized.	RFNS
7	**Mobile Deregistered** This bit is set if the CMU had to leave the signalling state "Registered" (because of a low signal etc.).	MDER
8	**Received Message** This bit is set when the MS received a short message from the CMU.	RMES
9	**FCH Active** This bit is set when data is transmitted via the Fundamental Channel.	FCH
11	**RF Input overdriven** This bit is set if the RF input level at connector RF1, RF2 or RF 4 IN is larger than the specified *RF Max. Level* plus an appropriate margin.	RFIO
12	**RF Input underdriven** This bit is set while the RF input level at connector RF1, RF2 or RF 4 IN falls below the measurement range controlled by the specified *RF Max. Level.*	RFIU

Special Terms and Notation

Below we list some particular features in the syntax of the CDMA commands. The general description of the SCPI command syntax can be found in Chapter 5 of the CMU Operating manual, section *"Structure and Syntax of Device Messages"*.

Description of commands

The commands are arranged in tables; all of them are described along the same scheme. From top to bottom, the table rows contain the following entries:

1. Complete command syntax including the parameter list and a short description of the command
2. List and description of the parameters with their default values, the default units and unit rings
3. Detailed description of the command, signalling state required for command execution (in Signalling mode), required firmware version

Detailed lists of default values are annexed to the command description.

Order of commands

The commands are arranged according to their function. The general purpose of a command is described by the keyword in the second level. Lower-level keywords define the command in more detail. This means that commands with the same second-level, third-level etc. keywords are generally grouped together in the same sections.

Example: `CONFigure:POWer:MAOutput:CONTrol:STATistics <Statistics>`

Commands with the keyword *POWer* in the second level belong to the power measurement. The keywords in the third, fourth and fifth level indicate that the command defines the number of bursts forming a statistics cycle in the measurement of the MS maximum output power.

Combined measurements

To limit the number of remote control commands in an application program, all scalar results of a measurement group are usually measured together and returned in a common list. Arrays (e.g. the traces for `POWer` and `MODulation` measurements) are returned as comma-separated lists of values; it is possible to retrieve either the whole list (see commands `READ:ARRay...` etc.) or the values located in a number of subranges that are part of the total measurement range (see commands `READ:SUBarrays...;` the subarrays are defined via `CONFigure:SUBarrays...`).

Parameters

Many commands are supplemented by a parameter or a list of parameters. Parameters either provide alternative options (setting a or setting b or setting c ..., see special character "|"), or they form a comma-separated list (setting x,y).

<Par_Name>

Alternative settings are described by a common name (literal) written in angle brackets (<>). This literal serves as a description of the parameters only; in an application program it must be replaced by one of the settings given in the detailed parameter description.

Example: `CONFigure:POWer:MAOutput:CONTrol:STATistics <Statistics>`
with `<Statistics> = 1 ... 10000 | NONE`

possible command syntax: `CONF:POW:MAO:CONT:STAT NONE`

NAN

NAN (not a number) is generally used to represent missing data, e.g. if a portion of a trace has not been acquired yet. It is also returned after invalid mathematical operations such as division by zero. As defined in the SCPI standard, NAN is represented as 9.91 E 37.

INV

INV (invalid) is returned if a limit check is performed without defining the appropriate tolerance values.

Upper / lower case

Upper/lower case characters characterize the long and short form of the keywords in a command. The short form consists of all upper-case characters, the long form of all upper case plus all lower case characters. Either the short form or the long form are allowed; mixed forms are not generally recognized. The instrument itself does not distinguish upper case and lower case characters.

Special characters

|

A vertical stroke in the parameter list characterizes alternative parameter settings. Only one of the parameters separated by | must be selected.

Example: The following command has two alternative settings:

`DEFault:LEVel ON | OFF`

[ ]

Key words in square brackets can be omitted when composing the command header (see Chapter 5 of the CMU Operating manual, section "Structure of a Command"). The complete command must be recognized by the instrument for reasons of compatibility with the SCPI standard.

Parameters in square brackets are optional as well. They may be entered in the command or omitted.

[?]

Remote control commands that can also be used as a query are indicated with [?] at the end of the command. As a query, the “?” (question mark) must be part of the command.

{ }

Braces or curly brackets enclose one or more parameters that may be included zero or more times.

<nr>

This symbol stands for a numeric suffix, e.g. an enumeration index for input and output connectors.

List of Commands

Command:

The *Command* column of the table contains all remote control commands arranged according to their function (configurations or measurement objects). Within a section, the commands are listed by alphabetical order.

Parameters:

The *Parameter* column lists the parameters of the commands.

Remarks:

The *Remarks* column gives additional information about the commands which

- Have no query form (no query)
- Have only a query form (query only)
- Can be used both as setting commands and as queries (with query, this applies to all commands belonging to one of the two preceding categories)

Alphabetical Lists

The end of Chapter 6 includes an alphabetical command list for both test modes.

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6 Remote Control – Commands

This chapter contains all remote-control commands for the CDMA function groups. The commands are presented in tabular form with their parameters and the ranges of values. The structure of this chapter is analogous to that of the reference part for manual operation (Chapter 4).

The measurement test modes *Non-Signalling* and *Signalling* are presented separately. Within the each measurement mode, the general configurations are presented first and then the individual measurement groups (test objects) are presented.

Measurement groups that are identical in both test modes *(`POWer, MODulation...`)* are presented in a separate section between the two test modes.

General notes on remote control in the CDMA function group can be found in Chapter 5. An introduction to remote control according to SCPI standard and the status registers of the CMU is given in Chapter 5 of the operating manual for the CMU basic instrument.

Note: *Remote control commands that can also be used as a query are indicated with [?] at the end of the command. As a query, the "?" (question mark) must be part of the command.*

Otherwise the command documentation follows SCPI conventions (see also Chapter 5): Keywords and parameters enclosed in square brackets are optional and can be omitted without changing the effect of the command.

CDMA Module Tests (Non-Signalling)

In the *Non-Signalling* mode, an RF test signal can be generated and an RF signal with CDMA characteristics is analyzed. No signalling parameters are transferred.

Connection Control

The remote-control commands presented in this section determine the RF analyzer settings and the signals generated by the CMU, the inputs and outputs used and the reference frequency. They correspond to the settings in the popup menu of the softkey *Connect Control*, located at the top right of each main menu.

In *Non Signalling,* the *Connection Control* settings are general (global) settings that are valid for the entire function group.

Subsystem RFANalyzer (Analyzed Input Signals)

The subsystem *RFANalyzer* configures the RF input path by defining the analyzer level and frequency. It corresponds to the tab *Analyzer* in the popup menu *Connection Control*.

DEFault:RFANalyzer[?] RF Analyzer
<RF Analyzer>

<RF Analyzer>	Description of parameters	Def. value	Def. unit	FW vers.
ON | OFF	The parameters are set to their default values The parameters differ from the default values (partially or totally)	ON	–	V3.05

Description of command

If used as a setting command with the parameter *ON,* this command sets all parameters of the subsystems RFANalyzer and LEVel to their default values (the setting OFF results in an error message).

If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.

[SENSe:]RFANalyzer:FREQuency:UNIT[?] Frequency Unit
<Analyzer Freq. Unit>

<Analyzer Freq. Unit>	Description of parameters	Def. Value	Def. unit	FW vers.
Hz | KHz | MHz | GHz | CH	Frequency unit or Channel Number	Hz	Hz	V3.05

Description of command

This command defines whether the frequency of the RF signal analyzed is specified in frequency units or as a CDMA channel number. Frequency units must be used to select input signals that are outside the designated channel range.

[SENSe:]RFANalyzer:FREQuency[?] RF Frequency
<Frequency>

<Frequency>	Description of parameters	Def. Value	Def. unit	FW vers.
10.000 000 MHz to 2 700 . 000 000 MHz	Input frequency Default input frequency for the following standards:		Hz	V3.05
	450 MHz, BC 5	450.60 MHz / CH 12		
	Cellular, BC0/BC2/BC3/BC7/BC9/BC10	833.49 MHz / CH 283		
	PCS – BC1/BC4/BC8	1857.50 MHz / CH 150		
	IMT2000 – BC6	1920.60 MHz / CH 12		

Description of command

This command defines the frequency of the RF signal analyzed. With the command `[SENSe:]RFANalyzer:FREQuency:UNIT`, the default frequency unit can be changed, and even CDMA channel numbers can be entered instead of frequencies. In the latter case, the assignment of channel numbers and frequencies meets the specification for the reverse channel (signal direction from mobile to CMU). BC = Band Class.

[SENSe:]RFANalyzer:FOFFset[?] Frequency Offset
<Analyzer Freq. Offset>

<Analyzer Freq. Offset>	Description of parameters	Def. value	Def. unit	FW vers.
–50.0 kHz to +50.0 kHz |	Frequency offset setting	OFF	Hz	V3.05
ON |	Frequency offset on, last setting re-activated			
OFF	No frequency offset			

Description of command

This command determines a frequency offset to the RF signal analyzed.

[SENSe:]LEVel:MODE[?] RF Level Mode
<RF Level Mode>

<RF Level Mode>	Description of parameters	Def. value	Def. unit	FW vers.
AUTomatic | MANual	Maximum input level mode for RF	MAN	–	V3.05

Description of command

This command defines the maximum expected input level mode.

[SENSe:]LEVel:MAXimum[?] Max. RF Level
<RF Manual Max Level>

<RF Manual Max Level>	Description of parameters	Def. value	Def. unit	FW vers.
–43 dBm to +44 dBm	Maximum input level for RF 1	0.0	dBm	V3.05
–57 dBm to +30 dBm	Maximum input level for RF 2	0.0	dBm	
–80 dBm to +9 dBm	Maximum input level for RF 4 IN	0.0	dBm	

Description of command

This command defines the maximum expected input level. The value range depends on the RF input used and the external attenuation set (see `[SENSe:]CORRection:LOSS:INPut<nr>[:MAGNitude]` command).

Subsystem TRIGger (Trigger Mode)

The subsystem *TRIGger* defines the trigger condition for the measurement and the routing of output trigger signals. It corresponds to the *Trigger* tab in the *Connection Control* menu.

DEFault:TRIGger[:SEQuence][?] Default All Settings
<Trigger Source>

<Trigger Source>	Description of parameters	Def. value	Def. unit	FW vers.
ON | OFF	The parameters are set to their default values Some or all parameters are not set to default	ON	–	V3.10

Description of command

If used as a setting command with the parameter *ON*, this command sets all parameters of the subsystem TRIGger to their default values (the setting OFF results in an error message).

If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.

DEFault:TRIGger[:SEQuence]:SOURce[?] Trigger
<Trigger Source>

<Trigger Source>	Description of parameters	Def. value	Def. unit	FW vers.
ON | OFF	The parameters are set to their default values Some or all parameters are not set to default	ON	–	V3.05

Description of command

If used as a setting command with the parameter *ON*, this command sets all parameters of the subsystem TRIGger:SOURce to their default values (the setting OFF results in an error message).

If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.

TRIGger[:SEQuence]:SOURce[:OQPSk][?] Trigger Source
TRIGger[:SEQuence]:SOURce:HPSK[?]
TRIGger[:SEQuence]:SOURce:QPSK[?]
<Source>

<Source>	Description of parameters	Def. Value	Def. unit	FW vers.
INTernal |	Trigger source from internal clock	FRUN	–	V3.05
EXTernal |	External Trigger source supplied	(EXT for		
FRUN |	Trigger set to free run	HPSK)		
RFPower |	Wideband RF power trigger			V3.40
IFPower	Narrow-band IF power trigger			

Description of command

This command selects the source of the trigger event. The settings *RFPower* and *IFPower* require burst signals. The external trigger source is supplied via the AUX 3 connector on the front panel. The AUX 3 pin assignments are:

Output trigger signals: See command `TRIGger:OUTPut:PIN<nr>:SIGNal[?]`

Input trigger: Pin 8: Trigger Input

H-PSK measurements and the Transmit Time Error measurement require particular trigger settings and synchronization; see Chapter 4.

TRIGger[:SEQuence]:THReshold:RFPower <*Threshold*> Level – RF Power

<Threshold>	Parameter description	Def. value	Default unit	FW vers.
LOW | **MEDium |** **HIGH**	Low trigger threshold *(RF Max. Level* – 26 dB) Medium trigger threshold *(RF Max. Level* – 16 dB) High trigger threshold *(RF Max. Level* – 6 dB)	MEDium	–	V3.40

Command description

This command sets the RF input signal level at which the measurement is triggered relative to the maximum RF input level; see `[SENSe:]LEVel:MAXimum`. The setting has effect for trigger source `RFPower` only (see `TRIG:SEQ:SOUR:<Modulation>`).

TRIGger[:SEQuence]:THReshold:IFPower <*Threshold*> Level – IF Power

<Threshold>	Parameter description	Def. value	Default unit	FW vers.
–47 dB to 0 dB	IF power threshold	–16	dB	V3.40

Command description

This command sets the IF signal level at which the measurement is triggered. The IF power threshold is defined relative to the maximum RF input level; see `[SENSe:]LEVel:MAXimum`. The setting has effect for trigger source `IFPower` only (see `TRIG:SEQ:SOUR:<Modulation>`).

TRIGger[:SEQuence]:SLOPe <*Slope*> Slope

<Slope>	Parameter description	Def. value	Default unit	FW vers.
POSitive | **NEGative**	Rising edge Falling edge	POS	–	V3.40

Command description

This command qualifies whether the trigger event occurs on the *Rising Edge* or on the *Falling Edge* of the trigger signal. The setting has no influence on *Free Run* measurements (see `TRIG:SEQ:SOUR`).

TRIGger:OUTPut:PIN<nr>:SIGNal[?]
<Frame_Period> Output Routing

<Frame_Period>	Description of parameters	Def. value	Def. unit	FW vers.
NONE | PP2S | SFRame | SNCFrame | PFRame | PCFRame | DEFault	No output trigger signal Periodic pulse with period 2 s Super frame, 80 ms Sync. frame, 26.67 ms Paging frame, 20 ms Power control frame, 1.25 ms Use default settings	<nr> = 2: SNCF <nr> = 3 = PP2S <nr> = 4 = SFR <nr> = 5 = PFR	–	V3.10

Description of command

This command selects the type of periodic pulse signal (or no signal, setting *NONE)* to be applied to pins 2, 3, 4,and 5 (<nr> = 2 to 5) of the AUX 3 connector.

RF Generator– RFGenerator

The subsystem *RFGenerator* configures the RF signals generated by the CMU. It corresponds to the tab *Generator* in the popup menu *Connection Control*.

DEFault:RFGenerator[?] RF Generator
<RF Generator>

<RF Analyzer>	Description of parameters	Def. value	Def. unit	FW vers.
ON | OFF	The parameters are set to their default values Some or all parameters are not set to default	ON	–	V3.05

Description of command

If used as a setting command with the parameter *ON*, this command sets all parameters of the subsystem RFGenerator to their default values (the setting OFF results in an error message).

If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.

INITiate:RFGenerator	Start RF generator, reserve resources	⇒ *RUN*
ABORt:RFGenerator	Switch off RF generator, release resources	⇒ *OFF*

Description of command	FW vers.
These commands have no query form. They start and stop the RF generator, setting it to the status indicated in the top right column.	V3.05

FETCh:RFGenerator:STATus? Generator Status

Returned values	Description of parameters	Def. Value	Def. unit	FW vers.
OFF | RUN | ERR	Generator switched off (`ABORt or *RST`) Running (`INITiate`) Switched off (could not be started)	OFF	–	V3.05

Description of command

This command is always a query. It returns the current generator status.

Generator Settings – Subsystem RFGenerator

The subsystem *RFGenerator* configures all settings for the generated RF signal. It corresponds to the tab *Generator* in the popup menu *Connection Control*.

SOURce:RFGenerator:LEVel:OCNS:VALue? OCNS Value

Returned value	Description of parameters	Def. value	Def. unit	FW vers.
OCNS	OCNS level relative to CDMA power	–	dB	V3.05

Description of command

This command is always a query. It returns the OCNS level in units relative to the CDMA power (see `SOURce:RFGenerator:LEVel` command).

SOURce:RFGenerator:LEVel:OCNS:ENABle[?] OCNS Enable
<OCNS Enable>

<OCNS Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | OFF	OCNS generator on or off	ON	–	V3.05

Description of command

This command turns the Orthogonal Channel Noise Simulator on or off. In the ON setting, the OCNS level is such that the sum of all generator levels and the OCNS level equals the nominal base station power. The query returns the OCNS level in units relative to the CDMA power (see `SOURce:RFGenerator:LEVel` command).

SOURce:RFGenerator:FREQuency[:RF]:UNIT[?] Frequency Unit
<Unit>

<Unit>	Description of parameters	Def. Value	Def. unit	FW vers.
Hz | KHZ | MHZ | GHZ | CH	Frequency unit or Channel Number	Hz	Hz	V3.05

Description of command

This command defines whether the frequency of the RF signal generated is specified in frequency units or as an CDMA channel number. Frequency units must be used to select input signals that are outside the designated CDMA channel range.

SOURce:RFGenerator:FREQuency[:RF][?] RF Frequency
<Frequency>

<Frequency>	Description of parameters	Def. Value	Def. unit	FW vers.
10.000 000 MHz to 2 700 . 000 000 MHz	Input frequency Default Input Frequency for following standards:		Hz	V3.05
	450 MHz, BC 5	460.60 MHz CH 25		
	Cellular, BC0/BC2/BC3/BC7/BC9/BC10	878.49 MHz CH 283		
	PCS – BC1/BC4/BC8	1937.50 MHz CH 150		
	IMT2000 – BC6	2110.60 MHz CH 12		

Description of command

This command defines the frequency of the RF signal generated. With the command `SOURce:RFGenerator:FREQuency:UNIT`, the default frequency unit can be changed, and even CDMA channel numbers can be entered instead of frequencies. In the latter case, the assignment of channel numbers and frequencies meets the specification for the forward channel (signal direction from CMU to mobile under test).

SOURce:RFGenerator:CHANnel:FFCH[?] Traffic Channel
<FFCH Channel>

<FFCH Channel>	Description of parameters	Def. Value	Def. unit	FW vers.
2 to 63	Traffic channel number	8	–	V3.05

Description of command

This command determines the number of the forward fundamental traffic channel generated by the CMU.

SOURce:RFGenerator:PROPerty:PNOFfset[?] PN Offset
<PN Offset>

<PN Offset>	Description of parameters	Def. value	Def. unit	FW vers.
0 to +511	PN offset	0	–	V3.05

Description of command

Describes an offset for the timing of the pilot channel, the sync channel message, and the long code mask of the paging channel.

SOURce:RFGenerator:FROFfset:FFCH[?] Frame Offset
<Frame Offs>

<Frame Offs>	Description of parameters	Def. value	Def. unit	FW vers.
0 to +15	Frame offset	0	–	V3.05

Description of command

This command defines an offset for the forward fundamental traffic channel timing in CDMA frames.

SOURce:RFGenerator:FRATe:FFCH[?] Frame Rate
<Frame Rate>

<Frame Rate>	Description of parameters	Def. value	Def. unit	FW vers.
EIGHth |	Frames at 1/8 of the rate set	FULL	–	V3.05
QUARter |	Frames at 1/4 of the rate set			
HALF |	Frames at 1/2 of the rate set			
FULL |	Frames at the full rate set			
DEF	Sets the value to the default setting			

Description of command

This command sets the frame rate for the forward fundamental traffic channel.

SOURce:RFGenerator:MODulation:MODe[?] Modulation Mode
<Modulation Mode>

<Modulation Mode>	Description of parameters	Def. value	Def. unit	FW vers.
AUTomatic |	CDMA2000 signal according to channel configuration	AUTomatic	–	V3.05
OFF |	Empty carrier signal (Continuous Wave)			
DEF	Sets the value to the default setting			

Description of command

This command selects the method used to modulate the generated RF signal.

SOURce:RFGenerator:POWer:CDMA[?] CDMA Power
<CDMA Power>

<CDMA Power>	Description of parameters	Def. value	Def. unit	FW vers.
–120.0 dBm to –33.0 dBm |	RF1 OUT, 0 dB ext. atten.	–70.0	dBm	V3.05
–120.0 dBm to –16.0 dBm |	RF2 OUT, 0 dB ext. atten.			
–100.0 dBm to 7.0 dBm	RF3 OUT, 0 dB ext. atten			

Description of command

This command determines total CDMA output power (absolute value, in dBm). CDMA Power value range depends on the RF input used and the external attenuation set.

SOURce:RFGenerator:POWer:OUTput? Output Power
<Output Power>

Returned value	Description of parameters	Def. value	Def. unit	FW vers.
Output Power	Total output power	NAN	dB	V3.05

Description of command

This command is always a query. It returns the total output power of the CMU, i.e. the CDMA power plus the AWGN level.

SOURce:RFGenerator:LEVel:FFCH[?] FFCH Level
<FFCH Level>

<FFCH Level>	Description of parameters	Def. value	Def. unit	FW vers.
–7 dB to –20 dB |	Forward fundamental channel level	–14	dB	V3.05
MIN |	Sets the value to the range minimum			
MAX |	Sets the value to the range maximum			
DEF |	Sets the value to the default setting			
ON |	Forward fundamental channel on, last setting re-activated			
OFF	Forward fundamental channel off			

Description of command

This command sets the signal level of the fundamental channel of the forward CDMA channel and enables or disables the signal.

SOURce:RFGenerator:LEVel:FSYNc[?] FSYNc Level
<FSYNC Level>

<FSYNC Level>	Description of parameters	Def. value	Def. unit	FW vers.
–7 dB to –20 dB |	Forward sync channel level	–16	dB	V3.05
MIN |	Sets the value to the range minimum			
MAX |	Sets the value to the range maximum			
DEF |	Sets the value to the default setting			
ON |	Forward sync channel on, last setting re-activated			
OFF	Forward sync channel off			

Description of command

This command sets the signal level of the sync channel of the forward CDMA channel and enables or disables the signal.

SOURce:RFGenerator:LEVel:FPICh[?] FPICh Level
<FPICH Level>

<FPICH Level>	Description of parameters	Def. value	Def. unit	FW vers.
–7 dB to –20 dB |	Forward pilot channel level	–7	dB	V3.05
MIN |	Sets the value to the range minimum			
MAX |	Sets the value to the range maximum			
DEF |	Sets the value to the default setting			
ON |	Forward pilot channel on, last setting re-activated			
OFF	Forward pilot channel off			

Description of command

This command sets the signal level of the pilot channel of the forward CDMA channel and enables or disables the signal.

SOURce:RFGenerator:LEVel:FPCH[?] FPCH Level
<FPCH Level>

<FPCH Level>	Description of parameters	Def. value	Def. unit	FW vers.
–7 dB to –20 dB | MIN | MAX | DEF | ON | OFF	Forward paging channel level Sets the value to the range minimum Sets the value to the range maximum Sets the value to the default setting Forward paging channel on, last setting re-activated Forward paging channel off	–12	dB	V3.05

Description of command

This command sets the signal level of the paging channel of the forward CDMA channel and enables or disables the signal.

CONFigure:RFGenerator:PCBits[?] Power Control Bits
<Power Control Bits>

<Power Control Bits>	Description of parameters	Def. value	Def. unit	FW vers.
OFF | AUTO | HOLD | ADOW | AUP | RTES | PATTern	Disable power control bits Auto mode, closed-loop operation Alternating up/down control bits All power control bits down All power control bits up Range test mode Pattern defined by means of the `SOURce:RFGenerator:PCBits:PATTern...` commands	AUToma tic	–	V3.20

Description of command

This command defines the power control bits in the RF generator signal.

SOURce:RFGenerator:PCBits:PATTern:SQMode[?] Pattern Sequence Mode
<Seq_Mode>

<Seq_Mode>	Description of parameters	Def. value	Def. unit	FW vers.
PREP | PFBA | PFBH	Pattern repeated Pattern Followed by Auto Pattern Followed by Hold	PREP	–	V3.20

Description of command

This command selects the algorithm to construct the complete user-defined pattern from the single bit pattern defined by means of the `SOURce:RFGenerator:PCBits:PATTern:AREA<nr>...` commands.

SOURce:RFGenerator:PCBits:PATTern:AREA<no>:NOBits[?] Number of Bits
<Number_of_Bits>

<Number_of_Bits>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 64 | 1 to 128	Number of bits for area no. 1 Number of bits for area no. 2, 3, 4	32 100	–	V3.20

Description of command

This command defines the number of bits in each of the 4 areas of the user-defined single pattern.

SOURce:RFGenerator:PCBits:PATTern:AREA1:LHBit[?] Last Hold Bit
<Polarity>

<Polarity>	Description of parameters	Def. value	Def. unit	FW vers.
UP | DOWN	Last Hold Bit	DOWN	–	V3.20

Description of command

This command defines the bit polarity in area no. 1 of the user-defined single pattern.

SOURce:RFGenerator:PCBits:PATTern:AREA<no>:POLarity[?] Polarity
<Polarity>

<Polarity>	Description of parameters	Def. value	Def. unit	FW vers.
UP | DOWN	Polarity	UP (area no. 2, 4) DOWN (area no. 3)	–	V3.20

Description of command

This command defines the bit polarity in areas 2 to 4 of the user-defined single pattern.

Generator Impairments – Subsystem IMPairments

The subsystem *IMPairments* configures the settings to impair the generated RF signal. The settings are provided in the *Generator* tab of the popup menu *Connection Control*.

SOURce:IMPairments:LEVel:AWGN[?] AWGN Level
<AWGN Level>

<AWGN Level>	Description of parameters	Def. value	Def. unit	FW vers.
–20.0 dB to +4.0 dB |	AWGN level	OFF	dB	V3.05
MIN |	Sets the value to the range minimum			
MAX |	Sets the value to the range maximum			
DEF |	Sets the value to the default setting			
ON |	AWGN generator on, last setting re-activated			
OFF	AWGN generator off			

Description of command

This command determines an Additional White Gaussian Noise level to impair the RF generator signal.

SOURce:IMPairments:FOFFset[:RF][?] BS Frequency Offset
<Freq. Offset>

<Freq. Offset>	Description of parameters	Def. value	Def. unit	FW vers.
–50.0 kHz to +50.0 kHz |	BS frequency offset setting	OFF	Hz	V3.05
MIN |	Sets the value to the range minimum			
MAX |	Sets the value to the range maximum			
DEF |	Sets the value to the default setting			
ON |	BS frequency offset on, last setting re-activated			
OFF	No frequency offset			

Description of command

This command defines an offset for the RF generator frequency set with the command `[SENSe:]RFGenerator:FREQuency <Number>`. The offset frequency must be in multiples of 1 Hz.

Subsystem for RF Input and Output (External Attenuation at the Connectors)

The subsystem for input and output configures the input and output RF connectors. The subsystem corresponds to the tab AF/*RF* in the popup menu *Connect Control*.

INPut[:STATe] RF Input
<State>

<State>	Description of parameters	Def. value	Def. unit	FW vers.
RF1 |	Connector RF 1 used as input	RF2	–	V3.05
RF2 |	Connector RF 2 used as input			
RF4	Connector RF 4 IN used as input			

Description of command

This command determines the connector to be used for RF input signals. The bidirectional connectors RF 1 and RF 2 can be used both as input and output connectors in the same measurement (see `OUTPut[:STATe]`).

Only one input and one output may be active at the same time, a new RF input setting supersedes the previous one.

OUTPut[:STATe] RF Output
<State>

<State>	Description of parameters	Def. value	Def. unit	FW vers.
RF1 |	Connector RF 1 used as output	RF2	–	V3.05
RF2 |	Connector RF 2 used as output			
RF3	Connector RF 3 OUT used as output			

Description of command

This command determines the connector to be used for RF output signals. The bidirectional connectors RF 1 and RF 2 can be used as input and output connectors in the same measurement (see `INPut[:STATe]`).

Only one input and one output may be active at the same time, a new RF output setting supersedes the previous one.

[SENSe:]CORRection:LOSS:INPut<nr>[:MAGNitude] Ext. Att. Input
SOURce:CORRection:LOSS:INPut<nr>[:MAGNitude]
<Attenuation>

<Attenuation>	Description of parameters	Def. value	Def. unit	FW vers.
–50 dB to +90 dB	Value for external attenuation at the input <nr>, where <nr> = 1, 2, 4	0.0	dB	V3.05

Description of command

This command assigns an external attenuation value to the inputs of the instrument *(RF 1, RF 2, RF 4 IN)*.

[SENSe:]CORRection:LOSS:OUTPut<nr>[:MAGNitude] Ext. Att. Output
SOURce:CORRection:LOSS:OUTPut<nr>[:MAGNitude]
<Attenuation>

<Attenuation>	Description of parameters	Def. value	Def. unit	FW vers.
–50 dB to +90 dB	Value for external attenuation at output <nr>, where <nr> = 1, 2, 3	0.0	dB	V3.05

Description of command

This command assigns an external attenuation value to the outputs of the instrument *(RF 1, RF 2, RF 3 OUT)*.

Subsystem DM:CLOCk (Synchronization)

The subsystem *DM:CLOCk* sets a system clock specific to the network. This frequency is set in the tab *Synch.* in the popup menu *Connect. Control*.

SOURce:DM:CLOCk:STATe
<Mode>
REF OUT 2

<Mode>	Description of parameters	Def. Value	Def. unit	FW vers.
ON | OFF	Switch on/off system clock	OFF	–	V3.05

Description of command

This commands switches the system clock specific to the network at the *REF OUT 2* connector on or off. When set to on, the frequency is set at 13.1072 MHz.

SOURce:DM:CLOCk:FREQuency ***<Frequency>***
<Frequency>
REF OUT 2

<Frequency>	Description of parameters	Def. value	Def. unit	FW vers.
39.3216 MHz | 19.6608 MHz | 13.1072 MHz | 9.8304 MHz	System Clock Frequency	39.3216	MHz	V3.03

Description of command

This command determines the system clock frequency applied to *REF OUT 2*. Any entered value is rounded to one of the four valid frequencies.

MODulation Measurements

The subsystem *MODulation* measures general scalar modulation parameters. The subsystem corresponds to the *Analyzer/Generator* menu and the popup menu *Modulation Quality Configuration.*

Control of Measurement – Subsystem MODulation

The subsystem *MODulation* controls the modulation measurement. It corresponds to the softkey *Mod. Qual.* in the measurement menu *Analyzer/Generator.*

INITiate:MODulation:MQUality[:OQPSk] **INITiate:MODulation:MQUality:HPSK** **INITiate:MODulation:MQUality:QPSK**	Start new measurement	⇒ *RUN*
ABORt:MODulation:MQUality[:OQPSk] **ABORt:MODulation:MQUality:HPSK** **ABORt:MODulation:MQUality:QPSK**	Abort running measurement and switch off	⇒ *OFF*
STOP:MODulation:MQUality[:OQPSk] **STOP:MODulation:MQUality:HPSK** **STOP:MODulation:MQUality:QPSK**	Stop measurement after current stat. cycle	⇒ *STOP*
CONTinue:MODulation:MQUality[:OQPSk] **CONTinue:MODulation:MQUality:HPSK** **CONTinue:MODulation:MQUality:QPSK**	Next measurement step (*stepping mode*)	⇒ *RUN*
Description of command		FW vers.
These commands have no query form. They start and stop the modulation measurement, setting it to the status indicated in the top right column.		V3.05

CONFigure:MODulation:MQUality[:OQPSk]:EREPorting[?] Event Reporting
CONFigure:MODulation:MQUality:HPSK:EREPorting[?]
CONFigure:MODulation:MQUality:QPSK:EREPorting[?]
<Report Mode>

<Report Mode>	Description of parameters	Def. Value	Def. unit	FW vers.
SRQ | SOPC | SRSQ | OFF | DEF	Service request Single operation complete SRQ and SOPC No reporting Sets the value to the default setting	OFF	–	V3.05

Description of command

This command defines the events generated when the measurement is terminated or stopped (see Chapter 5 of the CMU 200 Operating manual about event reporting).

FETCh[:SCALar]:MODulation:MQUality[:OQPSk]:STATus?
FETCh[:SCALar]:MODulation:MQUality:HPSK:STATus?
FETCh[:SCALar]:MODulation:MQUality:QPSK:STATus?

Measurement Status

Returned values	Description of parameters	Def. Value	Def. unit	FW vers.
OFF |	Measurement in the OFF state (*RST or ABORt)	OFF	–	V3.05
RUN |	Running (after INITiate, CONTinue or READ)			
STOP |	Stopped (STOP)			
ERR |	OFF (could not be started)			
STEP |	Stepping mode (<stepmode>=STEP)			
RDY	Stopped according to repetition mode and stop condition			

Description of command

This command is always a query. It returns the status of the measurement (see Chapters 3 and 5).

XTND:MODulation:MQUality[:OQPSk]:SBSuppress[?]
XTND:MODulation:MQUality:HPSK:SBSuppress[?]
XTND:MODulation:MQUality:QPSK:SBSuppress[?]

Extend Sideband Suppression Measurement

<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON |	Extend sideband suppression measurement (4 offset freq.)	OFF	–	V3.10
OFF |	Sideband suppression measurement (1 offset frequency)			
DEFault	Use the default setting			

Description of command

This command enables or disables the extended input and output arrays for the sideband suppression measurement, see commands `CONFigure:MODulation:MQUality...LIMit`, `READ[:SCALar]:MODulation:MQUality...`, `FETCh[:SCALar]:MODulation:MQUality...`, `SAMPle[:SCALar]:MODulation:MQUality...` and `CALCulate[:SCALar]:MODulation:MQUality...MATChing:LIMit`.

The measurement of the upper and lower sideband suppression at the four offset frequencies can be enabled or disabled separately; see commands `CONFigure:MODulation:MQUality:<Application>:CONTrol:FOFFset:SBSuppress:ACP<nr>`.

Test Configuration

The commands of the following subsystems configure the *Modulation* measurement in the *Analyzer/Generator* menu. They correspond to the *Modulation Quality Configuration* menu.

Subsystem MODulation:MQUality:CONTrol

The subsystem *MODulation:MQUality:CONTrol* configures the modulation measurement. It corresponds to the tabs *Control* and *Statistics* in the popup menu *Modulation Quality Configuration*.

DEFault:MODulation:MQUality:CONTrol[?] Default Settings

<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | OFF	The parameters are set to their default values Some or all parameters are not set to default	ON	–	V3.05

Description of command

If used as a setting command with the parameter *ON*, this command sets all parameters of the subsystem OVERview:MODulation:CONTrol to their default values (the setting OFF results in an error message).

If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.

DEFault:MODulation:MQUality[:OQPSk]:CONTrol[?]
DEFault:MODulation:MQUality:HPSK:CONTrol[?]
DEFault:MODulation:MQUality:QPSK:CONTrol[?]
<Enable> Default Settings

<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | OFF	The parameters are set to their default values Some or all parameters are not set to default	ON	–	V3.05

Description of command

If used as a setting command with the parameter *ON*, this command sets all parameters of the MODulation:MQUality:*:CONTrol subsystem to their default values (the setting OFF results in an error message).

If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.

CONFigure:MODulation:MQUality[:OQPSk]:CONTrol[?] Scope of Measurement
CONFigure:MODulation:MQUality:HPSK:CONTrol[?]
CONFigure:MODulation:MQUality:QPSK:CONTrol[?]
<Statistics>, <Repetition>, <Stop Cond>, <Step Mode>

<Statistics>	Description of parameters	Def. value	Def. unit	
1 to 1000,	Number of bursts within a statistics cycle	100	–	
<Repetition>	Description of parameters	Def. value	Def. unit	
1 to 10000 | CONT | SING | DEF,	Multiple measurement (counting, until Status = STEP | RDY)Continuous measurement (until STOP or ABORT) Single shot measurement (until Status = RDY) Sets the value to the default setting	SING	–	
<Stop Cond>	Description of parameters	Def. value	Def. unit	
NONE | SONerror | DEF,	Continue measurement even in case of error Stop measurement in case of error *(stop on error)* Sets the value to the default setting	NONE	–	
<Step Mode>	Description of parameters	Def. value	Def. unit	FW vers.
NONE | STEP | DEF	Continue measurement according to its rep. mode Interrupt measurement after each statistics cycle Sets the value to the default setting	NONE	–	V3.05

Description of command

This command sets all measurement control parameters. It combines the `...CONTrol:STATistics` and the `...CONTrol:REPetition` commands.

CONFigure:MODulation:MQUality[:OQPSk]:CONTrol:STATistics[?] Statistic Count
CONFigure:MODulation:MQUality:HPSK:CONTrol:STATistics[?]
CONFigure:MODulation:MQUality:QPSK:CONTrol:STATistics[?]
<Statistics>

<Statistics>	Description of parameters	Def. Value	Def. unit	FW vers.
1 to 1000	Number of bursts within a statistics cycle	100	–	V3.05

Description of command

This command selects the type of measured values and determines the number of bursts forming one statistics cycle.

Test Cycles

CONFigure:MODulation:MQUality[:OQPSk]:CONTrol:REPetition[?]
CONFigure:MODulation:MQUality:HPSK:CONTrol:REPetition[?]
CONFigure:MODulation:MQUality:QPSK:CONTrol:REPetition[?]
<Repetition>, <Stop Cond>, <Step Mode>

<Repetition>	Description of parameters	Def. value	Def. unit	
1 to 10000	Multiple measurement (counting, until Status = STEP | RDY)Continuous	SING	–	
CONT |	measurement (until STOP or ABORT)			
SING |	Single shot measurement (until Status = RDY)			
DEF,	Sets the value to the default setting			

<Stop Cond>	Description of parameters	Def. value	Def. unit	
NONE |	Continue measurement even in case of error	NONE	–	
SONerror |	Stop measurement in case of error *(stop on error)*			
DEF,	Sets the value to the default setting			

<Step Mode>	Description of parameters	Def. value	Def. unit	FW vers.
NONE |	Continue measurement according to its rep. mode	NONE	–	V3.05
STEP |	Interrupt measurement after each statistics cycle			
DEF	Sets the value to the default setting			

Description of command

This command determines the number of statistics cycles, the stop condition and the stepping mode for the measurement.

Note: *In the case of READ commands (`READ:...`), the <Repetition> parameter has no effect; the measurement is always stopped after a single shot.*

Sideband Frequency Offset

CONFigure:MODulation:MQUality[:OQPSk]:CONTrol:FOFFset:SBSuppress:ACP<nr>[?]
CONFigure:MODulation:MQUality:HPSK:CONTrol:FOFFset:SBSuppress:ACP<nr>[?]
CONFigure:MODulation:MQUality:QPSK:CONTrol:FOFFset:SBSuppress:ACP<nr>[?]
<Freq. Offset>

<Freq. Offset>	Description of parameters	Def. value	Def. unit	FW vers.
0 to 2 MHz |	Sideband frequency offset	see	Hz	V3.10
DEF | MIN | MAX |	Sets the value to the default setting | minimum | maximum	below		
OFF	Measurement disabled, result INV			

Description of command

This command sets up to 4 frequency offset values (<nr> = 1 to 4) used for the sideband suppression power measurement. The default values are 90 000 Hz for <nr> = 1, 1980 000 Hz for <nr> = 2 and OFF for the two remaining frequency offset values. The sideband suppression measurement yields 4 pairs of results corresponding to symmetrical frequency offsets to the RF frequency (command `[SENSe:]RFANalyzer:FREQuency[?]`).

Tolerance values – Subsystem MODulation:LIMit

The subsystem *MODulation:LIMit* defines tolerance values for the modulation measurement. The subsystem corresponds to the *Limits* tab in the popup menu *Modulation Quality Configuration.*

CONFigure:MODulation:MQUality[:OQPSk]:CMMax:LIMit[?] Limits
CONFigure:MODulation:MQUality:HPSK:CMMax:LIMit[?]
CONFigure:MODulation:MQUality:QPSK:CMMax:LIMit[?]
<Waveform Quality Limit>, <Carrier Freq. Limit>, <Transmit Time Error Limit>, <Carrier Feedthrough Limit>, <Sideband Suppr. 1>, <Sideband Suppr. 2>, <Sideband Suppr. 3>, <Sideband Suppr. 4>,

<Waveform Quality Limit>	Description of parameters	Def. value	Def. unit	
0.0 to 1.0 | OFF | ON,	Limit for waveform quality No waveform quality limit check Limit check on, last setting re-activated	0.944	–	
<Carrier Freq. Limit>	Description of parameters	Def. value	Def. unit	
0 Hz to 1000 Hz | OFF | ON,	Upper limit for carrier frequency error No carrier frequency error limit check Limit check on, last setting re-activated	300	Hz	
<Transmit Time Error Limit>	Description of parameters	Def. value	Def. unit	
0.0 s to 0.00001 s | OFF | ON,	Upper limit for transmit time error No transmit time error limit Limit check on, last setting re-activated	0.000001	s	
<Carrier Feedthrough Limit>	Description of parameters	Def. value	Def. unit	
–120 dB to –20 dB | OFF | ON,	Upper limit for carrier feedthrough No carrier feedthrough limit check Limit check on, last setting re-activated	–25	dB	
<RESERVED>	Description of parameters	Def. value	Def. unit	
,	Reserved for future setting	–	–	
<Sideband Suppr. 1>	Description of parameters	Def. value	Def. unit	FW vers.
–128 dB to 0 dB | OFF | ON,	Limit for sideband suppression at frequ. offset 1 No sideband suppres limit check Limit check on, last setting re-activated	–43	dB	V3.05
<Sideband Suppr. 2>	Description of parameters	Def. value	Def. unit	FW vers.
–128 dB to 0 dB | OFF | ON,	Limit for sideband suppression at frequ. offset 2 No sideband suppres limit check Limit check on, last setting re-activated	–54	dB	V3.10
<Sideband Suppr. 3>	Description of parameters	Def. value	Def. unit	FW vers.
–128 dB to 0 dB | OFF | ON,	Limit for sideband suppression at frequ. offset 3 No sideband suppres limit check Limit check on, last setting re-activated	–43	dB	V3.10
<Sideband Suppr. 4>	Description of parameters	Def. value	Def. unit	FW vers.
–128 dB to 0 dB | OFF | ON	Limit for sideband suppression at frequ. offset 4 No sideband suppres limit check Limit check on, last setting re-activated	–43	dB	V3.10

Description of command

This command defines limits for *Current* and *Max/Min* quantities describing the modulation quality. The values *<Sideband Suppr. 2>, <Sideband Suppr. 3>, <Sideband Suppr. 4>* are only available if the sideband suppression extension is enabled; see command `XTND:MODulation:MQUality:<Application>:SBSuppress`.

CONFigure:MODulation:MQUality[:OQPSk]:AVERage:LIMit[?] Limits
CONFigure:MODulation:MQUality:HPSK:AVERage:LIMit[?]
CONFigure:MODulation:MQUality:QPSK:AVERage:LIMit[?]
<Waveform Quality Limit>, <Carrier Freq. Limit>, <Transmit Time Error Limit>, <Carrier Feedthrough Limit>, <Sideband Suppr. 1>, <Sideband Suppr. 2>, <Sideband Suppr. 3>, <Sideband Suppr. 4>

<Waveform Quality Limit>	Description of parameters	Def. value	Def. unit	
0.0 to 1.0 | OFF | ON,	Limit for waveform quality No waveform quality limit check Limit check on, last setting re-activated	0.944	–	
<Carrier Freq. Limit>	Description of parameters	Def. value	Def. unit	
0 Hz to 1000 Hz | OFF | ON,	Upper limit for carrier frequency error No carrier frequency error limit check Limit check on, last setting re-activated	300	Hz	
<Transmit Time Error Limit>	Description of parameters	Def. value	Def. unit	
0.0 s to 0.00001 s | OFF | ON,	Upper limit for transmit time error No transmit time error limit Limit check on, last setting re-activated	0.000001	s	
<Carrier Feedthrough Limit>	Description of parameters	Def. value	Def. unit	
–120 dB to –20 dB | OFF | ON,	Upper limit for carrier feedthrough No carrier feedthrough limit check Limit check on, last setting re-activated	–25	dB	
<RESERVED>	Description of parameters	Def. value	Def. unit	
,	Reserved for future setting	–	–	
<Sideband Suppr. 1>	Description of parameters	Def. value	Def. unit	FW vers.
–128 dB to 0 dB | OFF | ON,	Limit for sideband suppression at frequ. offset 1 No sideband suppres limit check Limit check on, last setting re-activated	–43	dB	V3.05
<Sideband Suppr. 2>	Description of parameters	Def. value	Def. unit	FW vers.
–128 dB to 0 dB | OFF | ON,	Limit for sideband suppression at frequ. offset 2 No sideband suppres limit check Limit check on, last setting re-activated	–54	dB	V3.05
<Sideband Suppr. 3>	Description of parameters	Def. value	Def. unit	FW vers.
–128 dB to 0 dB | OFF | ON,	Limit for sideband suppression at frequ. offset 3 No sideband suppres limit check Limit check on, last setting re-activated	–43	dB	V3.05
<Sideband Suppr. 4>	Description of parameters	Def. value	Def. unit	FW vers.
–128 dB to 0 dB | OFF | ON	Limit for sideband suppression at frequ. offset 4 No sideband suppres limit check Limit check on, last setting re-activated	–43	dB	V3.05

Description of command

This command defines limits for the *Average* quantities describing the modulation quality. The values <*Sideband Suppr. 2*>, <*Sideband Suppr. 3*>, <*Sideband Suppr. 4*> are only available if the sideband suppression extension is enabled; see command `XTND:MODulation:MQUality:<Application>:SBSuppress`.

DEFault:MODulation:MQUality[:OQPSk]:CMMax:LIMit[?]
DEFault:MODulation:MQUality:HPSK:CMMax:LIMit[?]
DEFault:MODulation:MQUality:QPSK:CMMax:LIMit[?]
<Enable>

Default Settings

<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | OFF	The parameters are set to their default values Some or all parameters are not set to default	ON	–	V3.05

Description of command

If used as a setting command with the parameter *ON,* this command sets all parameters of the MODulation:MQUality:*:LIMit subsystem to their default values (the setting OFF results in an error message). The length of the parameter lists in the `CONFigure:MODulation:MQUality...CMMax:LIMit` commands is not affected.

If used as a query, the command returns whether all parameters are set to their default values *(ON)* or not *(OFF).*

The keyword `CMMax` refers to the *Current* and *Max./Min.* limits.

DEFault:MODulation:MQUality[:OQPSk]:AVERage:LIMit[?]
DEFault:MODulation:MQUality:HPSK:AVERage:LIMit[?]
DEFault:MODulation:MQUality:QPSK:AVERage:LIMit[?]
<Enable>

Default Settings

<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | OFF	The parameters are set to their default values Some or all parameters are not set to default	ON	–	V3.05

Description of command

If used as a setting command with the parameter *ON,* this command sets all parameters of the MODulation:MQUality:*:LIMit subsystem to their default values (the setting OFF results in an error message). The length of the parameter lists in the `CONFigure:MODulation:MQUality...AVERage:LIMit` commands is not affected.

If used as a query, the command returns whether all parameters are set to their default values *(ON)* or not *(OFF).*

The keyword `CMMax` refers to the *Current* and *Max./Min.* limits.

DEFault:MODulation:MQUality:LIMit[?]
<Enable>

Default Settings

<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | OFF	The parameters are set to their default values Some or all parameters are not set to default	ON	–	V3.05

Description of command

If used as a setting command with the parameter *ON,* this command sets all parameters of the subsystem MODulation:LIMit to their default values (the setting OFF results in an error message). The length of the parameter lists in the `CONFigure:MODulation:MQUality...LIMit` commands is not affected.

If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF).*

Measured Values – Subsystem MODulation

The subsystem *MODulation* measures and returns the modulation parameters and compares them with the tolerance values. The subsystem corresponds to the various output elements in the measurement menu *Analyzer/Generator.*

READ[:SCALar]:MODulation:MQUality[:OQPSk]?
READ[:SCALar]:MODulation:MQUality:HPSK?
READ[:SCALar]:MODulation:MQUality:QPSK?
Start single shot measurement and return results

FETCh[:SCALar]:MODulation:MQUality[:OQPSk]?
FETCh[:SCALar]:MODulation:MQUality:HPSK?
FETCh[:SCALar]:MODulation:MQUality:QPSK?
Read out measurement results (unsynchronized)

SAMPle[:SCALar]:MODulation:MQUality[:OQPSk]?
SAMPle[:SCALar]:MODulation:MQUality:HPSK?
SAMPle[:SCALar]:MODulation:MQUality:QPSK?
Read out measurement results (synchronized)

Returned values	Value range	Def. value	Def. unit	FW vers.
MS Power (x3),	–120.0 dBm to –33.0 dBm	NAN	dBm	V3.05
Waveform Quality (x3),	0.0 to +1.0	NAN	–	
Carrier Frequency Error (x3),	–10.0 Hz to 0.0 Hz	NAN	Hz	
Transmit Time Error (x3),	0.0 to 0.00001	NAN	s	
Carrier Feedthrough (x3),	–120.0 dB to -20.0 dB	NAN	dB	
RESERVED (x3),				
Lower Sideband Supp. 1 (x3),	–120 dB to 10 dB	NAN	dB	
Upper Sideband Supp. 1 (x3)	–120 dB to 10 dB	NAN	dB	
Lower Sideband Supp. 2 (x3),	–120 dB to 10 dB	NAN	dB	
Upper Sideband Supp. 2 (x3)	–120 dB to 10 dB	NAN	dB	
Lower Sideband Supp. 3 (x3),	–120 dB to 10 dB	NAN	dB	
Upper Sideband Supp. 3 (x3)	–120 dB to 10 dB	NAN	dB	
Lower Sideband Supp. 4 (x3),	–120 dB to 10 dB	NAN	dB	
Upper Sideband Supp. 4 (x3)	–120 dB to 10 dB	NAN	dB	
Out of Tolerance	0% to 100 %	NAN	%	

Description of command

These commands are always queries. They start a modulation measurement and output all scalar measurement results (see Chapter 4). The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average,* and the *MMax* value. Sideband Supp. 1 to Sideband Supp. 4 denotes the sideband suppression at offset frequencies 1 to 4; see commands CONFigure:MODulation:MQUality:<Application> :CONTrol:FOFFset:SBSuppress:ACP<nr>[?]. The sideband suppression values 2 to 4 are available only if the measurement is enabled; see commands `XTND:MODulation:MQUality:<Application>:SBSuppress`.

CALCulate[:SCALar]:MODulation:MQUality[:OQPSk]:MATChing:LIMIt?
CALCulate[:SCALar]:MODulation:MQUality:HPSK:MATChing:LIMIt?
CALCulate[:SCALar]:MODulation:MQUality:QPSK:MATChing:LIMIt?

Limit Matching

Returned values	Value range	Def. value	Def. unit	FW vers.
Waveform Quality (x3),		INV	–	V3.05
Carrier Frequency Error (x3),	For all measured values:	INV	–	
Tansmit Time Error (x3),		INV	–	
Carrier Feedthrough (x3),	NMAU | NMAL | INV | OK	INV	–	
RESERVED (x3),				
Lower Sideband Supp. 1 (x3),		INV	–	
Upper Sideband Supp. 1 (x3)		INV	–	
Lower Sideband Supp. 2 (x3),		INV	–	
Upper Sideband Supp. 2 (x3)		INV	–	
Lower Sideband Supp. 3 (x3),		INV	–	
Upper Sideband Supp. 3 (x3)		INV	–	
Lower Sideband Supp. 4 (x3),		INV	–	
Upper Sideband Supp. 4 (x3)		INV	–	

Description of command

This command is always a query. It indicates whether and in which way the error limits for the scalar measured values (see above command) have been exceeded. The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average,* and the *MMax* value. Sideband Supp. 1 to Sideband Supp. 4 denotes the sideband suppression at offset frequencies 1 to 4; see commands `CONFigure:MODulation:MQUality:<Application>:CONTrol:FOFFset:SBSuppress:ACP<nr>[?]`. The sideband suppression values 2 to 4 are available only if the measurement is enabled; see commands `XTND:MODulation:MQUality:<Application>:SBSuppress`.

The following messages may be output for all measured values:

NMAU	Underflow of tolerance value	*not matching, underflow*
NMAL	Tolerance value exceeded	*not matching, overflow*
INV	Measurement invalid	*invalid*
OK	all tolerances matched	

Common Measurements and Command Groups

The commands for the measurement groups in this section are identical or almost identical in both test modes. Minor differences between *Non Signalling* and *Signalling* commands are possible; they will be pointed out throughout the section.

Note: ***Measurements and signalling states***

To perform any kind of measurement and obtain a meaningful result, an appropriate test setup is required (see application examples in chapter 2 of this manual). Consequently, if the measurements reported in this section are performed in Signalling mode, the Call Established (CEST) signalling state must be reached before any of the commands retrieving test results (`READ...?`, `FETCh...?`, `SAMPle...?`, or `CALCulate...LIMit?`) can be used. Test configurations, however, can be defined any time.

Exception: *The wideband power (`WPOWer`) does not involve any signalling. It can be measured irrespective of the current signalling state.*

Option Query

The *Options* subsystem contains the commands for querying information on the instrument and the available options. It corresponds to the *Options* tab in the *Setup* menu opened via the *SETUP* key on the front panel.

SYSTem:OPTions:INFO:CURRent?			Device Info
Response	Def. value	Default unit	FW vers.
Example: Rohde&Schwarz,CMU 200-1100.0008.02,840675/018, V3.10C:SP02 2002-10-05"CDMA2K450MS_Sig"	–	–	V3.10
Command description			
This command returns information on the device comprising the manufacturer, model, serial number and firmware version of the current function group. This command is always a query.			

SYSTem:VERSion:SW:MMI?			MMI Software Version
Response	Def. Value	Default unit	FW vers.
Example: "1.00C[3.40:SP00]"	–	–	V3.20
Command description			
This command returns information about the current version of the CDMA2k MMI module. This command may be helpful for driver development as the MMI module determines the GPIB command set. This command is always a query.			

Partial Reset

The `RESet` subsystem restores the (factory) default values for the current function group and test mode. It is similar to the *Reset* menu opened via the *RESET* key on the front panel.

SYSTem:RESet:CURRent	Partial Reset
Command description	FW vers.
This command sets all parameters of the current function group and test mode to default values. The command is available in all function groups. In contrast to the *Reset* menu the command restores the default values defined for remote control operation. In cases where remote and manual control use distinct settings (e.g. the repetition mode for many measurements), the manual control settings are left unchanged.	V3.10

Configuration File Management – System MMEMory

The `MMEMory` system provides mass storage capabilities for the CMU. The functionality of this system is included in the *Data* menu; see CMU200/300 operating manual.

The mass storage of the CMU may be internal or external. The internal mass storage device is a section on the internal hard disk that is reserved for mass storage (directory c:\temp). The external mass storage device is either a floppy disk or a PCMCIA memory card, depending on the instrument configuration. The <*msus*> (mass storage unit specifier) parameter in the `MMEMory` commands denotes the root directory of the *INTernal* or *EXTernal* mass storage device.

The <FileName> parameter is a string. The contents of the string may contain characters for specifying subdirectories, e.g. "\TEMP\TRASH\test.txt" for the file named *test.txt* in the *TEMP\TRASH* subdirectory of the root directory or "TEMP\TRASH\test.txt" for the file named *test.txt* in the *TEMP\TRASH* subdirectory of the current directory, to be queried with the base system command `MMEMory:DIRectory [:CURRent]?`. The file name itself may contain the period as a separator for extensions.

MMEMory:SAVE:CURRent *<FileName> [,<msus>]*
Save configurations in current function group and test mode

Parameters	Parameter description	Def. value	Def. unit	FW vers.
"<FileName>",	Name of the config. file to be created	–	–	V3.10
INTernal | EXTernal	Storage device of the config. file	INTernal	–	

Command description

This command saves the configuration of the current function group and test mode to a configuration file. A "?" in the specified file name will be replaced by current numbers that are automatically incremented, starting with zero. The auto-increment function overwrites an existing file with a "9" in its file name. For instrument settings that may be different in manual and remote control (e.g. the repetition mode for many measurements) the manual setting is saved. The command is available in all function groups. This command is CMU-specific.

MMEMory:RECall:CURRent *<FileName> [,<msus>]*
Recall configurations in current function group and test mode

Parameters	Parameter description	Def. value	Def. unit	FW vers.
"<FileName>",	Name of the config. file to be recalled	–	–	V3.10
INTernal | EXTernal	Storage device of the config. file	INTernal	–	

Command description

This command recalls the configuration of the current function group and test mode from a configuration file. The command is available in all function groups. This command is CMU-specific.

I/Q-IF Interface

The subsystem *IQIF* configures the signal paths for I/Q and IF signals provided by option CMU-B17, *I/Q and IF Interfaces*. It corresponds to the *I/Q-IF* tab of the *Connection Control* menu.

Hint: *How to make sense out of parameter names*

In all path configurations except bypass, both the I/Q and IF output are connected (to either the RF Unit, the Digital Unit or one of the I/Q-IF inputs). The paths differ in the connection of the input branches: The qualifier IO denotes a connected input (with connected output), XO denotes a disconnected input (with connected output). Many parameters of the IQIF commands are composed of two IO/XO qualifiers, the first one standing for the IF signal, the second for the I/Q signal.

Example: *The parameter IOXO denotes a connected IF input and a disconnected IF output, while both output branches are connected.*

For more information see Chapter 4 and the application examples in the CMU200/300 operating manual.

CONFigure:IQIF:RXTXcombined *<Scenario>* I/Q-IF

<Scenario>	Description of parameters	Def. value	Def. unit	FW vers.
BYP	RX/TX Bypass, `RXPath = BYP, TXPath = BYP`	BYP	–	V3.10
BYIQ	Bypass w. I/Q-OF OUT, `RXPath = TXPath =BYIQ`			
XOIO	I/Q IN/OUT, `RXPath = TXPath = XOIO`			
IOIO	IF IN_I/Q IN/OUT, `RXPath = TXPath = IOIO`			
IOXO	IF IN/OUT, `RXPath = TXPath = IOXO`			
FPAT	Fading Path, `RXPath = BYP, TXPath = XOIO`			
UDEF	User-defined scenario, can not be set but may be returned by the query `CONF:IQIF:RXTX?`			

Description of command

This command selects the I/Q-IF test scenario, overwriting the current RX and TX path settings (see commands `CONFigure:IQIF:RXPath` and `CONFigure:IQIF:TXPath` below). Six different predefined test scenarios with fixed RX and TX path are provided. Additional scenarios may be defined by selecting any other combination of RX and RX paths.

Note: *`UDEF` is not provided as a setting parameter. If the RX/TX path combination defined via `CONFigure:IQIF:RXPath` and `CONFigure:IQIF:TXPath` doesn't correspond to any of the predefined scenarios, then a user-defined scenario is set implicitly, i.e. the query `CONF:IQIF:RXTX?` returns the value `UDEF`.*

CONFigure:IQIF:RXPath *<Path>* RX Path

<Path>	Description of parameters	Def. value	Def. unit	FW vers.
BYP	Bypass	BYP	–	V3.10
BYIQ	Bypass w. I/Q-IF OUT			
XOIO	I/Q IN/OUT			
IOIO	IF IN_I/Q IN/OUT			
IOXO	IF IN/OUT			

Description of command

This command selects the RX signal path, leaving the TX path (see command `CONFigure:IQIF:TXPath` below) unchanged but adapting the I/Q-IF test scenario to the new RX/TX path combination: If the combination corresponds to a predefined scenario, then `CONFigure:IQIF:RXTXcombined` is set to the predefined scenario; otherwise it is set to `UDEF`.

CONFigure:IQIF:TXPath <*Path*>		TX Path		
<Path>	Description of parameters	Def. value	Def. unit	FW vers.
BYP **BYIQ** **XOIO** **IOIO** **IOXO**	Bypass Bypass w. I/Q-IF OUT I/Q IN/OUT IF IN_I/Q IN/OUT IF IN/OUT	BYP	–	V3.10
Description of command				
This command selects the TX signal path, leaving the RX path (see command `CONFigure:IQIF:RXPath` above) unchanged but adapting the I/Q-IF test scenario to the new RX/TX path combination: If the combination corresponds to a predefined scenario, then `CONFigure:IQIF:RXTXcombined` is set to the predefined scenario; otherwise it is set to `UDEF`.				

IQIF:DEFault <Enable>		Default Settings		
<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | **OFF**	The parameters are set to their default values Some or all parameters differ from the default values	ON	–	V3.10
Description of command				
If used as a setting command with the parameter *ON* this command sets all parameters of the subsystem to their default values (the setting *OFF* causes an error message). If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.				

Symbolic Status Event Register Evaluation

The following commands are used to retrieve the events reported in function groups *GSM400/850/900/1800/1900-MS Non Signalling* and *Signalling*; see section *Symbolic Status Event Register Evaluation* in Chapter 5 of the CMU operating manual.

STATus:OPERation:SYMBolic:ENABle <Event>{,<Event>}		Symbolic status evaluation		
Parameter list	Parameter description	Def. Value[1]	Default Unit	FW vers.
<Event>{,<Event>} | **NONE**	List of symbols for events to be reported No event reported	NONE	–	V3.05
Command description				
This command enables event reporting for one or several events in the current *GSMxxx-MS Non Signalling* function group, i.e. it sets the corresponding bits in the `STATus:OPERation:CMU:SUM<nr>:CMU<nr_event>:ENABle` register (`<nr> = 1 | 2, <nr_event>` denotes the current function group) and in all sum registers up to the status byte. The events and the corresponding symbols for the function group are listed in Chapter 5 (see section *Status Registers)*. The symbols may be entered in arbitrary order.				

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[1] The default values quoted in this command are achieved after a `STATus:PRESet` command. `*RST` does not overwrite the entries in the status registers; see section *Reset Values of the Status Reporting Systems* in chapter 5.

STATus:OPERation:SYMBolic[:EVENt]? Symbolic status evaluation

Response	Parameter description	Def. Value[2]	Default Unit	FW vers.
NONE |	No event in the *RF* function group	NONE	–	V3.05
<Event>{,<Event>}	List of reported events			

Command description

This command is always a query. It lists the events reported in the current *GSMxxx-MS Non Signalling* function group and deletes these events in the `STATus:OPERation:CMU:SUM<nr>:CMU<nr_event>:EVENt` register as well as in all sum registers.

Wideband Power – WPOWer

The subsystem *WPOWer* measures the power of the signal transmitted by the mobile phone using a wideband filter. It corresponds to the softkey *Wideband Power* in the *Connect. Control* menu.

INITiate:WPOWer	Start new measure ment	⇒ *RUN*
ABORt:WPOWer	Abort measurement and switch off	⇒ *OFF*
STOP:WPOWer	Stop measurement	⇒ *STOP*
CONTinue:WPOWer	Next measurement step (only *counting mode*)	⇒ *RUN*

Description of command	FW vers.
These commands have no query form. They start or stop the measurement, setting it to the status given in the top right column.	1.15[3]

CONFigure:WPOWer:EREPorting <*Mode*> Event Reporting

<Mode>	Description of parameters	Def. value	Def. unit	FW vers.
SRQ |	Service request	OFF	–	1.17
SOPC |	Single operation complete			
SRSQ |	SRQ and SOPC			
OFF	No reporting			

Description of command

This command defines the events generated when the measurement is terminated or stopped *(event reporting,* see chapter 5 of CMU200 operating manual).

FETCh:WPOWer:STATus? Measurement

Return	Description of parameters	Def. value	Def. unit	FW vers.
OFF |	Measurement in the *OFF* state (`*RST` or `ABORt`)	OFF	–	1.15
RUN |	Running (after `INITiate, CONTinue` or `READ`)			
STOP |	Stopped (`STOP`)			
ERR |	*OFF* (could not be started)			
STEP |	Stepping mode *(<stepmode>=STEP)*			
RDY,	Stopped according to repetition mode and stop condition			
	Counter for current statistics cycle			
1 ... 10000 |	No counting mode set			
NONE		NONE	–	

Description of command

This command is always a query. It returns the status of the measurement (see chapters 3 and 5 of CMU operating manual).

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[2] The default values quoted in this command are achieved after a `*CLS` command. `*RST` does not overwrite the entries in the status registers; see section *Reset Values of the Status Reporting Systems* in chapter 5.

[3] For firmware versions <V2.15, the keyword `WPOWer` is replaced by `SPOWer` in all commands.

CONFigure:WPOWer:CONTrol:REPetition ***<Repetition>,<StopCond>,<Stepmode>***				Test cycles
<Repetition>	Description of parameters	Def. value	Def. unit	
CONTinuous | **SINGleshot |** **1 ... 10000**	Continuous measurement (until `STOP` or `ABORT`) Single shot measurement (until `Status = RDY`) Multiple measurement (*counting*, until `Status = STEP | RDY`)	SING	–	
<StopCond>	Description of parameters	Def. value	Def. unit	
SONerror | **NONE**	Start measurement in case of error *(stop on error)* Continue measurement even in case of error	NONE	–	
<Stepmode>	Description of parameters	Def. value	Def. unit	FW vers.
STEP | **NONE**	Interrupt measurement after each statistics cycle Continue measurement according to its rep. mode	NONE	–	1.15
Description of command				
This command determines the number of statistics cycles, the stop condition and the stepping mode for the measurement. **Note:** *In the case of READ commands (`READ:...`), the <Repetition> parameter has no effect; the measurement is always stopped after a single shot.*				

Measured Values – Subsystem WPOWer?

The subsystem *WPOWer?* retrieves the results of the wideband power measurement.

READ[:SCALar]:WPOWer? **FETCh[:SCALar]:WPOWer?** **SAMPle[:SCALar]:WPOWer?**	Start single shot measurement and return results Read out measurement results (unsynchronized) Read out measurement results (synchronized)			
Return	Description of parameters	Def. value	Def. unit	FW vers.
–30.0dBm to +30.0 dBm	Maximum burst power (not averaged)	NAN	dBm	1.15
Description of command				
These commands are always queries. They start the measurement of the maximum burst power *(peak burst power)* and return the result.				

Narrow-Band Power – NPOWer

The subsystem *NPOWer* measures the Narrow Band Power using CDMA2000 receiver filters. It corresponds to the *NPower* application of the *Power* measurement.

The CMU measures the average, maximum and minimum power of the RF signal in a waveform interval. In addition to these *Current* values the minimum and maximum power in the entire measurement and the average of the average current values, referenced to a statistics cycle, is calculated (see section *Measured Values – Subsystem NPOWer* on p. 6.32 ff.). The measurement can be made with a variable number of samples, see command `CONFigure:NPOWer:CONTrol:CBSize`.

Control of measurement – Subsystem NPOWer

The subsystem *NPOWer* controls the narrow band power measurement. It corresponds to the *NPower* softkey in the *Power* measurement.

INITiate:NPOWer	Start new measurement	⇒ *RUN*
ABORt:NPOWer	Abort running measurement and switch off	⇒ *OFF*
STOP:NPOWer	Stop measurement after current stat. cycle	⇒ *STOP*
CONTinue:NPOWer	Next measurement step (*stepping mode*)	⇒ *RUN*

Description of command	FW vers.
These commands have no query form. They start and stop the power measurement, setting it to the status indicated in the top right column.	V3.05

CONFigure:NPOWer:EREPorting[?] *<Report Mode>* Event Reporting

<Report Mode>	Description of parameters	Def. value	Def. unit	FW vers.
SRQ | **SOPC |** **SRSQ |** **OFF**	Service request Single operation complete SRQ and SOPC No reporting	OFF	–	V3.05

Description of command
This command defines the events generated when the measurement is terminated or stopped (see *Event Reporting* in Chapter 5 of the CMU manual).

FETCh[:SCALar]:NPOWer:STATus? Measurement Status

Return	Description of parameters	Def. value	Def. unit	FW vers.
OFF | **RUN |** **STOP |** **ERR |** **STEP |** **RDY**	Measurement in the OFF state (*RST or ABORt) Running (after INITiate, CONTinue or READ) Stopped (STOP) OFF (could not be started) Stepping mode (<stepmode>=STEP) Stopped according to repetition mode and stop condition	OFF	–	–
1 to 10000 | **NONE**	Counter for current statistics cycle No counting mode set	NONE	–	–
1 to 1000 **NONE**	Counter for current evaluation period within a cycle Statistic count set to off	NONE	–	V3.05

Description of command
This command is always a query. It returns the status of the measurement (see Chapters 3 and 5).

Subsystem NPOWer:CONTrol

The subsystem *NPOWer:CONTrol* defines the repetition mode and statistic count of the measurement. It corresponds to the *Control* tab of the *Power Configuration* menu.

CONFigure:NPOWer:CONTrol:CBSize[?] Capture Buffer Size
<Samples>

<Samples>	Description of parameters	Def. value	Def. unit	FW vers.
1024 to 32768 | **MINimum |** **MAXimum |** **DEF**	Total number of samples Sets the value to the range minimum Sets the value to the range maximum Sets the value to the default setting	4096	–	V3.10

Description of command

This command specifies the number of samples acquired to calculate a single shot `NPOWer` result. A fixed oversampling factor of 4 is used so that the duration of the measurement interval (evaluation period) is proportional to the capture buffer size. Increasing the number of samples slows down the measurement but may be necessary to obtain meaningful results, because CDMA2000 signals typically show rapid variations in time and a large crest factor.

CONFigure:NPOWer:CONTrol[?] Scope of Measurement
<Statistics>, <Repetition>, <Stop Condition>, <Step Mode>

<Statistics>	Description of parameters	Def. value	Def. unit	
1 to 1000 | **MINimum |** **MAXimum |** **DEF,**	Number of bursts per statistics cycle Sets the value to the range minimum Sets the value to the range maximum Sets the value to the default setting	100	–	
<Repetition>	Description of parameters	Def. value	Def. unit	
1 to 10000 | **CONTinuous |** **SINGleshot |** **DEFault,**	Multiple measurement (counting, until Status = STEP | RDY) Continuous measurement (until STOP or ABORT) Single shot measurement (until Status = RDY) Sets the value to the default setting	SING	–	
<Stop Condition>	Description of parameters	Def. value	Def. unit	
NONE | **SON,**	Continue measurement even in case of error Stop measurement in case of error *(stop on error)*	NONE	–	
<Step Mode>	Description of parameters	Def. value	Def. unit	FW vers.
NONE | **STEP**	Continue measurement according to its rep. mode Interrupt measurement after each statistics cycle	NONE	–	V3.05

Description of command

This command combines the `...CONTrol:STATistics` and the `...CONTrol:REPetition` commands

CONFigure:NPOWer:CONTrol:STATistics[?] Statistic Count
<Statistics>

<Statistics>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 1000 | **MINimum |** **MAXimum |** **DEF**	Number of bursts per statistics cycle Sets the value to the range minimum Sets the value to the range maximum Sets the value to the default setting	100	–	V3.05

Description of command

This command specifies the type of measured values and defines the number of bursts forming a statistics cycle.

CONFigure:NPOWer:CONTrol:REPetition[?] ***<Repetition>, <Stop Cond>, <Step Mode>***				Test Cycles
<Repetition>	Description of parameters	Def. value	Def. unit	
1 to 10000 |	Multiple measurement (counting, until Status = STEP | RDY)	SING	–	
CONTinuous |	Continuous measurement (until STOP or ABORT)			
SINGleshot |	Single shot measurement (until Status = RDY)			
DEFault,	Sets the value to the default setting			
<Stop Cond>	Description of parameters	Def. value	Def. unit	
NONE |	Continue measurement even in case of error	NONE	–	
SONerror |	Stop measurement in case of error *(stop on error)*			
DEFault,	Default value			
<Step Mode>	Description of parameters	Def. value	Def. unit	FW vers.
NONE |	Continue measurement according to its rep. mode	NONE	–	V3.05
STEP |	Interrupt measurement after each statistics cycle			
DEFault	Default value			
Description of command				
This command determines the number of statistics cycles for the measurement.				
Note: *In the case of READ commands (`READ:...`), the <Repetition> parameter has no effect; the measurement is always stopped after a single shot.*				

Measured Values – Subsystem NPOWer

The subsystem *NPOWer* determines and outputs the results of the Narrow Band Power measurements. It corresponds to the output fields in the *Power* measurement menu.

READ[:SCALar]:NPOWer? **FETCh[:SCALar]:NPOWer?** **SAMPle[:SCALar]:NPOWer?**	Scalar results: Start single shot measurement and return results Read out measurement results (unsynchronized) Read out measurement results (synchronized)			
Returned values	Description	Def. value	Def. unit	FW vers.
Avg. Power of Current evaluation period,	For all measurements		dBm	V3.05
Min. Power of Current evaluation period,			dBm	
Max. Power of Current evaluation period,	Scalar values returned		dBm	
Avg. Power referenced to a stat. cycle,			dBm	
Min. Power of the entire measurement,			dBm	
Max. Power of the entire measurement			dBm	
Description of command				
These commands are always queries. They start a measurement and output all scalar measurement results.				

CDMA Mobile Tests (Signalling Mode)

In the *Signalling* mode, the CMU is able to generate control and traffic channel signals and to set up a call to the mobile. A broad range of signalling parameters can be configured and measurements may be performed with a call connection established.

Network Standards – NETWork

The *NETWork* system switches between the different CDMA network standards.

CONFigure:NETWork:STANdard[?] <*Standard*>				Network Standard
<Standard>	Description of parameters	Def. value	Def. unit	
CDMA2000 450 MHz				
N45T |	N45T, Band Class 5	NMT-450	–	
CDMA2000 Cellular				
USC |	US Cellular, Band Class 0	USC	–	
KCEL |	Korean Cellular, Band Class 0			
TACS |	TACS, Band Class 2			
JTAC |	JTACS, Band Class 3			
NA7C |	North American 700 MHz, Band Class 7			
NA9C |	North American 900 MHz, Band Class 9			
NA8S |	Secondary 800 MHz, Band Class 10			
CDMA2000 PCS				
NAPC |	North American PCS, Band Class 1	NAPC	–	
KPCS |	Korean PCS, Band Class 4			
B18M |	1800 MHz, Band Class 8			
CDMA2000 IMT-2000				FW vers.
IM2K	IMT-2000, Band Class 6	IM2K	–	V3.05
Description of command				Sig. State
This command activates the test mode according to one of the provided CDMA network standards.				All

Connection Control

The remote-control commands presented in this section control the signalling (call setup and release, services, signalling parameters), determine the inputs and outputs as well as the reference frequency. They correspond to the settings in the popup menu of the softkey *Connect Control* located at the top right of each main menu.

Note: *Some parameters of the CMU assume several independent values: The default value is used to set up a call; most default values can be modified in the signalling states Signal Off, Signal On and Registered. The current value during the call (signalling states Connected) can still be changed, however, modifying this current value does not alter the default value. The handoff value comes into effect after a handoff from another to the current network; most handoff values can be set in all signalling states.*

Note: *Many of the default and current parameters in CDMA2000-MS occur in the SIGNalling and in the BSSignal subsystems.*

Default values are set with a `CONFigure ...` command, current values are set with the corresponding `PROCedure ...` command.

Signalling – Subsystem SIGNalling (Call Setup and Cleardown)

The subsystem *SIGNalling* controls the call setup and cleardown from the CMU to the mobile and determines the signalling parameters. It corresponds to the tab *Connection* (for different signalling states, see command `PROCedure:SIGNalling:ACTion`) in the popup menu *Connection Control*.

PROCedure:SIGNalling:ACTion ***<Signalling Action>***				Signalling Control
<Signalling Action>	Description of parameters	Def. value	Def. unit	FW vers.
SOFF | SON | UNRegister CTMobile | CRELease | HANDoff | SMESsage	Switch off RF signal *(signal off)* Switch on RF signal *(signal on)* Unregister the mobile Call to mobile Call release Handoff Send SMS	SOFF	–	V3.05
Description of command				Sig. State
This command has no query form and no default value. It changes between the different signalling states of the CMU.				See below

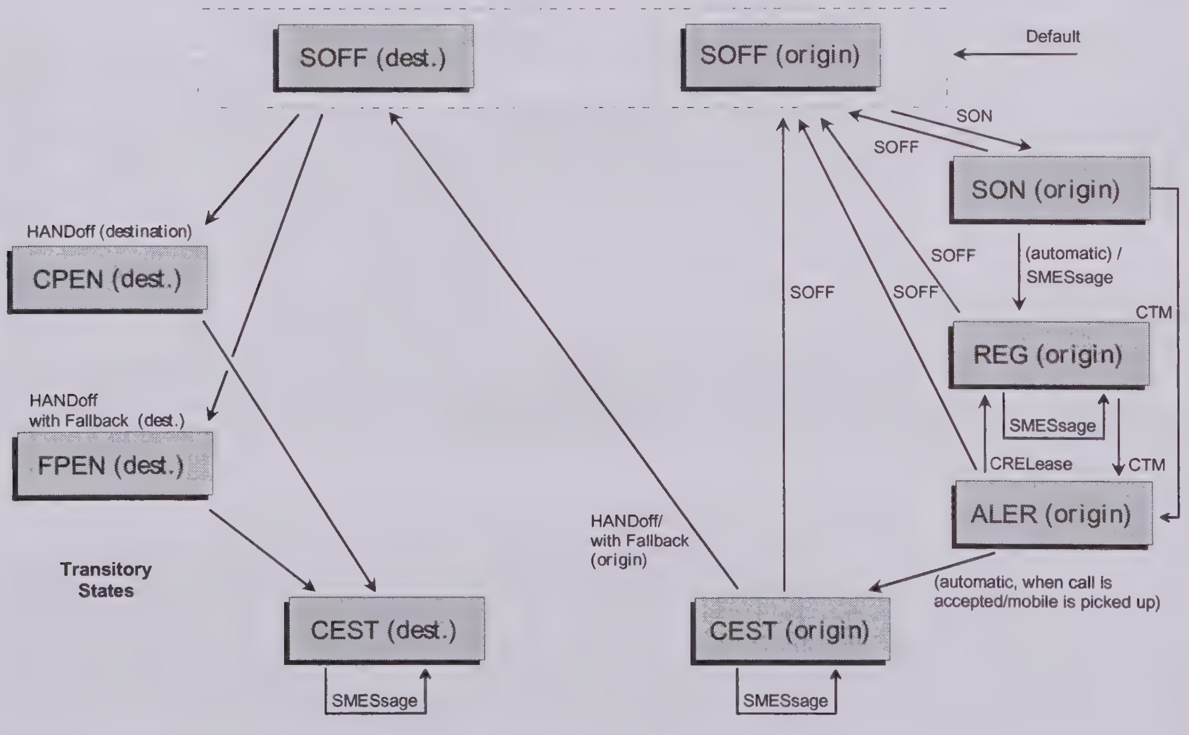

Figure 6-1: Signalling states of the CMU and transitions including Handoff

Signalling states:

See description of command `[SENSe:]SIGNalling:STATe?`

Actions (initiated from the CMU):

See description of command `[PROCedure:]SIGNalling:ACTion`

Further transitions between the signalling states (not shown in Figure 6-1) may occur, e.g. in case of errors. For the transitions and signalling states related to handoff procedures (CDMA to AMPS) refer to the AMPS-MS operating manual.

[SENSe:]SIGNalling:STATe?				Signalling State
Returns	Description of parameters	Def. value	Def. unit	FW vers.
SOFF | SON | REG | ALER | CEST | CPEN | FPEN | SMESsage	RF signal switched off *(Signal Off)* RF signal switched on *(Signal On)* MS registration performed *(Registered)* Mobile is ringing *(Alerting)* Call to mobile set up *(Call Established)* Call pending *(Handoff* procedures) Fallback pending *(Handoff* procedures) Short message being sent	SOFF	–	V3.05
Description of command				Sig. State
This command is always a query. It returns the current signalling state.				All

Subsystem Mobile Information

The subsystem *MSSinfo* queries the mobile station for its properties. The subsystem corresponds to the *MS Information* in the *Connection* tab of the *Connection Control* menu. The mobile phone properties do not actually represent measured values, they are provided by the mobile phone during registration.

Note: *If no mobile is connected, or if the mobile under test is not synchronized (signalling states SOFF, SON), the queries in this section will return the default values INV. The Mobile ID and serial number are available in the REG and CEST states. The remaining information is available in the CEST state only and are overwritten by INV if registration is lost (transition from REG or CEST to SON or SOFF).*

[SENSe:]MSSinfo?				Mobile Information
Returns	Description of parameters	Def. value	Def. unit	FW vers.
Protocol revision of the mobile station,	1 to 6	NAN	–	V3.05
Mobile Country Code,	0 to 999	NAN		
National Mobile Station Identification,	34-bit MIN (mobile identification number) or 50-bit IMSI	NAN		
ESN of the mobile station,	Electronic Serial number of the mobile station	NAN	–	
Max. EIRP	Maximum Effective Isotropic Radiated Power	NAN	–	
Description of command				Sig. State
This command is always a query. It returns the mobile station information.				All

[SENSe:]MSSinfo:PREVision?				Mobile Information
Returns	Description of parameters	Def. value	Def. unit	FW vers.
Protocol revision of the mobile station	1 to 6	NAN	–	V3.05
Description of command				Sig. State
This command is always a query. It returns the protocol revision supported by the mobile station.				All

[SENSe:]MSSinfo:BCLSupport?				Mobile Information
Returns	Description of parameters	Def. value	Def. unit	FW vers.
Band Class Support	Returns the supported mobile station band class in the form: (0|1),(0|1),(0|1),(0|1),(0|1),(0|1),(0|1),(0|1),(0|1),(0|1),(0|1) to indicate not supported (0) or supported (1) for band classes 0 through 10.	NAN	–	V3.05
Description of command				Sig. State
This command is always a query. It returns the band class supported by the mobile station.				All

[SENSe:]MSSinfo:SCLSupport?				Mobile Information
Returns	Description of parameters	Def. value	Def. unit	FW vers.
Sub Band Class Support	Returns the supported mobile station subband class in the form: (0|1),(0|1),(0|1),(0|1),(0|1),(0|1),(0|1),(0|1) to indicate not supported (0) or supported (1) for subband classes 0 through 7.	NAN	–	V3.05
Description of command				Sig. State
This command is always a query. It returns the sub-band class supported by the mobile station.				All

[SENSe:]MSSinfo:TERMinal?				Mobile Information
Returns	Description of parameters	Def. value	Def. unit	FW vers.
Manufacturer Code,	Mobile station manufacturer code number	–	–	V3.05
Model Number,	Mobile station model number	–	–	
Firmware Revision,	Mobile station firmware revision	–	–	
Local Control,	NSUP | SUPP Local control not supported or supported	–		
Reported Service Options	Mobile station service option	–	–	
Description of command				Sig. State
This command is always a query. It returns the mobile station's information.				All

[SENSe:]MSSinfo:AUTHentic?				Authentication
Returns	Description of parameters	Def. value	Def. unit	FW vers.
Authent. Mode,	NSUP | SUPP, Support of authentication	–	–	V3.10
Auth. Response,	Authentication response from the MS, 4-digit hex string	–	–	
RANDC,	The eight most-significant bits of the random challenge value used by the MS (decimal 0 to 255)	–	–	
Call History Count	Value of the call history parameter COUNT used for clone detection (decimal 0 to 255)	–		
Description of command				Sig. State
This command is always a query. It returns the mobile station's authentication information.				All

Subsystem Connection Information

The subsystem *CINFo* queries the parameters used to attempt the connection. The subsystem corresponds to the *Connection Information* section in the *Connection* tab of the *Connection Control* menu. The connection parameters does not actually represent measured values, they are provided by the mobile phone during registration.

Note: *If no mobile is connected, or if the mobile under test is not synchronized (signalling states SOFF, SON), the queries in this section will return the default values INV. The information is provided while the CMU is in the CEST state.*

[SENSe:]CINFo:DNUMber?				Dialed Number
Returns	Description of parameters	Def. value	Def. unit	FW vers.
Dialed Number	String parameter	–	–	V3.05
Description of command				Sig. State
This command is always a query. It returns the number dialed at the MS.				All

[SENSe:]CINFo:GECall?				Global Emergency Call
Returns	Description of parameters	Def. value	Def. unit	FW vers.
Global Emergency Call	Boolean parameter, 0 (false) or 1 (true)	–	–	V3.05
Description of command				Sig. State
This command is always a query. It returns whether the current call is a global emergency call.				All

[SENSe:]CINFo:SOPTion?				Connected Service Options
Returns	Description of parameters	Def. value	Def. unit	FW vers.
SO no., "SO Name", ... SO no., "SO Name"	Number of 1st connected service option Name of 1st connected service option, string variable Number of last connected service option Name of last connected service option, string variable	–	–	V3.05
Description of command				Sig. State
This command is always a query. It returns the numbers and names of all connected service options.				All

[SENSe:]CINFo:FCH:MOPTions?				Connected MUX Options (FCH)
Returns	Description of parameters	Def. value	Def. unit	FW vers.
FWD MUX, REV MUX	Connected forward MUX option, hex value Connected reverse MUX option, hex value	–	–	V3.05
Description of command				Sig. State
This command is always a query. It returns the connected forward and reverse multipled options for the FCH.				All

[SENSe:]CINFo:FCH:RC?				Connected Radio Configurations (FCH)
Returns	Description of parameters	Def. value	Def. unit	FW vers.
FWD RC, REV RC	Connected forward radio configuration, decimal value Connected reverse radio configuration, decimal value	–	–	V3.05
Description of command				Sig. State
This command is always a query. It returns the connected forward and reverse radio configurations for the FCH.				All

[SENSe:]CINFo:SCH:ZERO:MOPTions?				Connected MUX Options (SCH0)
Returns	Description of parameters	Def. value	Def. unit	FW vers.
FWD MUX, REV MUX	Connected forward MUX option, hex value Connected reverse MUX option, hex value	–	–	V3.05
Description of command				Sig. State
This command is always a query. It returns the connected forward and reverse MUX options for the SCH0.				All

[SENSe:]CINFo:SCH:ZERO:RC?				Connected Radio Configurations (SCH0)
Returns	Description of parameters	Def. value	Def. unit	FW vers.
FWD RC, REV RC	Connected forward radio configuration, decimal value Connected reverse radio configuration, decimal value	–	–	V3.05
Description of command				Sig. State
This command is always a query. It returns the connected forward and reverse radio configurations for the SCH0.				All

Subsystem Messaging (WMT) Information

The subsystem *MINFo* queries information about the last outgoing short message (SMS) and the last short message received at the mobile. The subsystem corresponds to the *Messaging (WMT) Information* section in the *Connection* tab of the *Connection Control* menu. The parameters of a short message to be sent are set in the `...SCONfig:SCLass1:WMT:SMS...` subsystem; see section *Subsytem SCONfig:SCLass:* on p. 6.71 ff.

The MINFo queries can be used in all signalling states, however, an SMS must be sent before real results can be obtained.

[SENSe:]MINFo:SMS:LOUTgoing:TSTamp?				Last Outgoing – Time Stamp
Returns	Description of parameters	Def. value	Def. unit	FW vers.
"hh:mm:ss"	Time stamp: hour, minutes, seconds (string parameter)	"–"	–	V3.10
Description of command				Sig. State
This command is always a query. It returns the time stamp associated to the last outgoing short message, if available. Adding a time stamp to a short message is enabled by means of the command `CONFigure:SCONfig:SCLass1:WMT:SMS:TSTamp:ENABle ON`.				All

[SENSe:]MINFo:SMS:LOUTgoing:ACKNowledge?				Last Outgoing – Acknowledge
Returns	Description of parameters	Def. value	Def. unit	FW vers.
ACKN |	Mobile acknowledged last message	–	–	V3.10
NACK |	Mobile did not acknowledge last message (because it was not requested to do so)			
FAIL	Mobile failed to acknowledge last message (although it was not requested to do so)			
Description of command				Sig. State
This command is always a query. It returns whether the mobile acknowledged the last outgoing short message. Short message acknowledgement is enabled by means of the command `CONFigure:SCONfig:SCLass1:WMT:SMS:ACKNowledge:ENABle ON`.				All

[SENSe:]MINFo:SMS:LOUTgoing:CCODe?				Last Outgoing – Cause Code
Returns	Description of parameters	Def. value	Def. unit	FW vers.
<8-bit value>	CAUSE_CODE	–	–	V3.10
Description of command				Sig. State
This command is always a query. It returns the contents of the CAUSE_CODE field of the *Alert With Info MS Order Confirmation Message.* The CAUSE_CODE provides the delivery status of SMS user data.				All

Subsystem Service Configuration

The subsystem SCONfig configures the service configuration to use when establishing a call to the mobile. It corresponds to the *Connection* and *Service Cfg.* tabs in the popup menu *Connection Control*.

[SENSe:]SCINfo?				Service Configuration Info
Returned Value	Description of parameters	Def. value	Def. unit	FW vers.
F-FCH-RO, R-FCH-RO,	Forward and Reverse Radio Configuration, values depending on multiplex option and service option (see Ch. 4)	–	–	V3.10
Option	Service Option, syntax: S<Option_no>D, e.g. S55D			
Description of command				Sig. State
This command is always a query. It returns the current radio configuration and service option.				All

DEFault:SCONfig[?] ***<Enable>***				Default Settings
Enable	Description of parameters	Def. value	Def. unit	FW vers.
ON | OFF	The parameters are set to their default values The parameters differ from their default values (partially or totally)	ON	–	V3.05
Description of command				Sig. State
If used as a setting command with the parameter *ON*, this command sets all parameters of the subsystem ServiceCONfig to their default values (the setting OFF results in an error message). If used as a query, the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.				All

CONFigure:SCONfig:SCLass1:SERVice[?] **PROCedure:SCONfig:SCLass1:SERVice[?]** ***<Service(n)>***				1st Service Class
<Service(n)>	Description of parameters	Def. value	Def. unit	FW vers.
LOOP | SPEech | TDAT | PDAT | WMT	Loopback service Speech service Test data service Packet data service Wireless messaging teleservice (`CONFigure`... only)	SPE	–	V3.05
Description of command				Sig. State
This command configures the service type to use to establish a call to the mobile. The Loopback mode must be used for receiver quality measurements. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.				See Descript.

CONFigure:SCONfig:AMOC[?] ***<Service(n)>***				Accept MS Originated Call
<Service(n)>	Description of parameters	Def. value	Def. unit	FW vers.
All | SCL1	Accept all calls Selected primary service only	ALL	–	V3.40
Description of command				Sig. State
This command selects the types of Mobile Station Originated Calls (MOC) that the CMU will accept.				SON, SOFF, REG

Subsytem SCONfig:SCLass:LOOP

The subsystem SCONfig:SCLass:LOOP defines the service options for the Loopback service type.

CONFigure:SCONfig:SCLass1:LOOP:SOPTion[?]
PROCedure:SCONfig:SCLass1:LOOP:SOPTion[?]
<Loopback Service Current Sel>

Loopback Service

<Loopback Service Current Sel>	Description of parameters	Def. value	Def. unit	FW vers.
S02D | S09D |	Service Option 2 Service Option 9	S02D	–	V3.05
Description of command				Sig. State
This command determines the service option to use when establishing a call in the loopback service mode. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.				See Descript.

CONFigure:SCONfig:SCLass1:LOOP:S02D:FCH?
PROCedure:SCONfig:SCLass1:LOOP:S02D:FCH?

Radio Configuration

Returned value	Description of parameters	Def. Value	Def. Unit	FW vers.
Forward Radio Configuration,	1 to 4	1	–	V3.05
Forward Multiplex Option,	1 to 4	1	–	
Reverse Radio Configuration,	1 to 3	1	–	
Reverse Multiplex Option	1 to 3	1	–	
Description of command				Sig. State
This command is always a query. It returns the radio configuration and the multiplex option of the forward and reverse fundamental traffic channel for service option 2. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.				See Descript.

CONFigure:SCONfig:SCLass1:LOOP:S09D:FCH?
PROCedure:SCONfig:SCLass1:LOOP:S09D:FCH?

Radio Configuration

Returned value	Description of parameters	Def. value	Def. unit	FW vers.
Forward Radio Configuration,	2 to 5	2	–	V3.05
Forward Multiplex Option,	2 to 5	2	–	
Reverse Radio Configuration,	2 to 4	2	–	
Reverse Multiplex Option	2 to 4	2	–	
Description of command				Sig. State
This command is always a query. It returns the radio configuration and the multiplex option of the forward and reverse fundamental traffic channel for service option 9. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.				See Descript.

CONFigure:SCONfig:SCLass1:LOOP:S55D:FCH? **PROCedure:SCONfig:SCLass1:LOOP:S55D:FCH?**				Radio Configuration
Returned value	Description of parameters	Def. value	Def. unit	FW vers.
Forward Radio Configuration,	1 to 5	1	–	V3.10
Forward Multiplex Option,	1 to 5	1	–	
Reverse Radio Configuration,	1 to 4	1	–	
Reverse Multiplex Option	1 to 4	1	–	
Description of command				Sig. State
This command is always a query. It returns the radio configuration and the multiplex option of the forward and reverse fundamental traffic channel for service option 55. The available radio configurations depend on the multiplex options; see Chapter 4. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.				See Descript.

CONFigure:SCONfig:SCLass1:LOOP:S02D:FCH:RC[?] **PROCedure:SCONfig:SCLass1:LOOP:S02D:FCH:RC[?]** ***<F_RC>, <R_RC>***				Radio Configuration
<F_RC>	Description of parameters	Def. value	Def. unit	
1 to 4 | MINimum | MAXimum | DEFault,	Forward radio configuration Sets the value to the range minimum Sets the value to the range maximum Sets the value to the default setting	1	–	
<R_RC>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 3 | MINimum | MAXimum | DEFault	Reverse radio configuration Sets the value to the range minimum Sets the value to the range maximum Sets the value to the default setting	1	–	V3.05
Description of command				Sig. State
This command sets the radio configuration of the forward and reverse fundamental traffic channel for service option 2. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.				See Descript.

CONFigure:SCONfig:SCLass1:LOOP:S09D:FCH:RC[?]
PROCedure:SCONfig:SCLass1:LOOP:S09D:FCH:RC[?]
<F_RC>*, *<R_RC>

Radio Configuration

<F_RC>	Description of parameters	Def. value	Def. unit	
2 to 5 |	Forward radio configuration	2	–	
MINimum |	Sets the value to the range minimum			
MAXimum |	Sets the value to the range maximum			
DEFault,	Sets the value to the default setting			
<R_RC>	Description of parameters	Def. value	Def. unit	FW vers.
2 to 4 |	Reverse radio configuration	2	–	V3.05
MINimum |	Sets the value to the range minimum			
MAXimum |	Sets the value to the range maximum			
DEFault	Sets the value to the default setting			

Description of command	Sig. State
This command sets the radio configuration of the forward and reverse fundamental traffic channel for service option 9. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.	See Descript.

CONFigure:SCONfig:SCLass1:LOOP:S55D:FCH:RC[?]
PROCedure:SCONfig:SCLass1:LOOP:S55D:FCH:RC[?]
<F_RC>*, *<R_RC>

Radio Configuration

<F_RC>	Description of parameters	Def. value	Def. unit	
12 to 5 |	Forward radio configuration	1	–	
MINimum |	Sets the value to the range minimum			
MAXimum |	Sets the value to the range maximum			
DEFault,	Sets the value to the default setting			
<R_RC>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 4 |	Reverse radio configuration	1	–	V3.10
MINimum |	Sets the value to the range minimum			
MAXimum |	Sets the value to the range maximum			
DEFault	Sets the value to the default setting			

Description of command	Sig. State
This command sets the radio configuration of the forward and reverse fundamental traffic channel for service option 55. The available radio configurations depend on the multiplex options; see Chapter 4. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.	See Descript.

CONFigure:SCONfig:SCLass1:LOOP:S55D:FCH:FORWard:MO[?] Multiplex Option, Forward
PROCedure:SCONfig:SCLass1:LOOP:S55D:FCH:FORWard:MO[?]
<F_FCH_MO>

<F_FCH_MO>	Description of parameters	Def. value	Def. unit	
1 | 2 | MINimum | MAXimum | DEFault	Forward multiplex option Sets the value to the range minimum Sets the value to the range maximum Sets the value to the default setting	1	–	

Description of command	Sig. State
This command sets the multiplex option of the forward fundamental traffic channel for service option 55. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.	See Descript.

CONFigure:SCONfig:SCLass1:LOOP:S55D:FCH:REVerse:MO[?] Multiplex Option, Reverse
PROCedure:SCONfig:SCLass1:LOOP:S55D:FCH:REVerse:MO[?]
<R_FCH_MO>

<R_FCH_MO>	Description of parameters	Def. value	Def. unit	
1 | 2 | MINimum | MAXimum | DEFault	Reverse multiplex option Sets the value to the range minimum Sets the value to the range maximum Sets the value to the default setting	1	–	

Description of command	Sig. State
This command sets the multiplex option of the reverse fundamental traffic channel for service option 55. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.	See Descript.

CONFigure:SCONfig:SCLass1:LOOP:S02D:FCH:FRAT[?] Frame Rate
PROCedure:SCONfig:SCLass1:LOOP:S02D:FCH:FRAT[?]
<Frame Rate>

<Frame Rate>	Description of parameters	Def. Value	Def. Unit	FW vers.
EIGHth | QUARter | HALF | FULL | DEFault	Frames at 1/8 of the rate set Frames at 1/4 of the rate set Frames at 1/2 of the rate set Frames at the full rate set Frame rate set to default	FULL	–	V3.05

Description of command	Sig. State
This command sets the frame rate for a traffic channel for test calls using service option 2. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.	See Descript.

CONFigure:SCONfig:SCLass1:LOOP:S09D:FCH:FRAT[?] **PROCedure:SCONfig:SCLass1:LOOP:S09D:FCH:FRAT[?]** ***<Frame Rate>***				Frame Rate
<Frame Rate>	Description of parameters	Def. Value	Def. Unit	FW vers.
EIGHth | QUARter | HALF | FULL | DEFault	Frames at 1/8 of the rate set Frames at 1/4 of the rate set Frames at 1/2 of the rate set Frames at the full rate set Frame rate set to default	FULL	–	V3.05
Description of command				Sig. State
This command sets the frame rate for a traffic channel for test calls using service option 9. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.				See Descript.

CONFigure:SCONfig:SCLass1:LOOP:S55D:FCH:FRAT[?] **PROCedure:SCONfig:SCLass1:LOOP:S55D:FCH:FRAT[?]** ***<Frame Rate>***				Frame Rate
<Frame Rate>	Description of parameters	Def. Value	Def. Unit	FW vers.
EIGHth | QUARter | HALF | FULL | DEFault	Frames at 1/8 of the rate set Frames at 1/4 of the rate set Frames at 1/2 of the rate set Frames at the full rate set Frame rate set to default	FULL	–	V3.10
Description of command				Sig. State
This command sets the frame rate for a traffic channel for test calls using service option 55. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.				See Descript.

CONFigure:SCONfig:SCLass1:LOOP:S02D:FCH:PGEN[?] **PROCedure:SCONfig:SCLass1:LOOP:S02D:FCH:PGEN[?]** ***<Pattern Generation>***				Pattern Generation
<Pattern Generation>	Description of parameters	Def. Value	Def. Unit	FW vers.
RANDom | FIXed | DEFault	Random Fixed	RAND	–	V3.05
Description of command				Sig. State
This command sets the pattern generation for service option 2 to either a random or fixed pattern. If this command is set to FIXed, pattern sent to the mobile station is defined with the command `CONFigure:SCONfig:SCLass1:LOOP:S02D:FCH:PATTern[?]`. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.				See Descript.

CONFigure:SCONfig:SCLass1:LOOP:S09D:FCH:PGEN[?]
PROCedure:SCONfig:SCLass1:LOOP:S09D:FCH:PGEN[?]
<Pattern Generation>

Pattern Generation

<Pattern Generation>	Description of parameters	Def. Value	Def. Unit	FW vers.
RANDom | FIXed | DEFault	Random Fixed	RAND	–	V3.05

Description of command	Sig. State
This command sets the pattern generation for service option 9 to either a random or fixed pattern. If this command is set to FIXed, pattern sent to the mobile station is defined with the command `CONFigure:SCONfig:SCLass1:LOOP:S09D:FCH:PATTern[?]`. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.	See Descript.

CONFigure:SCONfig:SCLass1:LOOP:S55D:FCH:PGEN[?]
PROCedure:SCONfig:SCLass1:LOOP:S55D:FCH:PGEN[?]
<Pattern Generation>

Pattern Generation

<Pattern Generation>	Description of parameters	Def. Value	Def. Unit	FW vers.
RANDom | FIXed | DEFault	Random Fixed	RAND	–	V3.10

Description of command	Sig. State
This command sets the pattern generation for service option 55 to either a random or fixed pattern. If this command is set to FIXed, pattern sent to the mobile station is defined with the command `CONFigure:SCONfig:SCLass1:LOOP:S55D:FCH:PATTern[?]`. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.	See Descript.

CONFigure:SCONfig:SCLass1:LOOP:S02D:FCH:PATTern[?]
PROCedure:SCONfig:SCLass1:LOOP:S02D:FCH:PATTern[?]
<Pattern>

Pattern

<Pattern>	Description of parameters	Def. Value	Def. Unit	FW vers.
{Hex value} | DEFault	Hex values for pattern generator	A5A5A5A 5A5A5A5 A5	–	V3.05

Description of command	Sig. State
This command defines the pattern used by the pattern generator for service option 2. This pattern is used when the Pattern Generation is set to FIXed. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.	See Descript.

CONFigure:SCONfig:SCLass1:LOOP:S09D:FCH:PATTern[?] Pattern
PROCedure:SCONfig:SCLass1:LOOP:S09D:FCH:PATTern[?]
<Pattern>

<Pattern>	Description of parameters	Def. Value	Def. Unit	FW vers.
{Hex value} | DEFault	Hex values for pattern generator	A5A5A5A5A5A5A5A5	–	V3.05

Description of command	Sig. State
This command defines the pattern used by the pattern generator for service option 9. This pattern is used when the Pattern Generation is set to FIXed. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.	See Descript.

CONFigure:SCONfig:SCLass1:LOOP:S55D:FCH:PATTern[?] Pattern
PROCedure:SCONfig:SCLass1:LOOP:S55D:FCH:PATTern[?]
<Pattern>

<Pattern>	Description of parameters	Def. Value	Def. Unit	FW vers.
{Hex value} | DEFault	Hex values for pattern generator	A5A5A5A5A5A5A5A5	–	V3.05

Description of command	Sig. State
This command defines the pattern used by the pattern generator for service option 55. This pattern is used when the Pattern Generation is set to FIXed. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.	See Descript.

Subsytem SCONfig:SCLass:SPEech

The subsystem SCONfig:SCLass:SPEech defines the service options for the Speech service type.

CONFigure:SCONfig:SCLass1:SPEech:SOPTion[?] Speech Service
PROCedure:SCONfig:SCLass1:SPEech:SOPTion[?]
<Speech Service Current Sel>

<Speech Service Current Sel>	Description of parameters	Def. value	Def. unit	FW vers.
S01D |	Service Option 1	S01D	–	V3.05
S03D |	Service Option 3			
S17D |	Service Option 17			
SX8T	Service Option 0X8000			

Description of command	Sig. State
This command determines the service option to use when establishing a call in the speech mode. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.	See Descript.

CONFigure:SCONfig:SCLass1:SPEech:S01D:FCH?
PROCedure:SCONfig:SCLass1:SPEech:S01D:FCH?
Radio Configuration

Returned value	Description of parameters	Def. value	Def. unit	FW vers.
Forward Radio Configuration,	1 to 4	1	–	V3.05
Forward Multiplex Option,	1 to 4	1	–	
Reverse Radio Configuration,	1 to 3	1	–	
Reverse Multiplex Option	1 to 3	1	–	

Description of command	Sig. State
This command is always a query. It returns the radio configuration and multiplex option of the forward and reverse fundamental traffic channel for service option 1. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.	See Descript.

CONFigure:SCONfig:SCLass1:SPEech:S03D:FCH?
PROCedure:SCONfig:SCLass1:SPEech:S03D:FCH?
Radio Configuration

Returned value	Description of parameters	Def. value	Def. unit	FW vers.
Forward Radio Configuration,	1 to 4	1	–	V3.05
Forward Multiplex Option,	1 to 4	1	–	
Reverse Radio Configuration,	1 to 3	1	–	
Reverse Multiplex Option	1 to 3	1	–	

Description of command	Sig. State
This command is always a query. It returns the radio configuration and multiplex option of the forward and reverse fundamental traffic channel for service option 3. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.	See Descript.

CONFigure:SCONfig:SCLass1:SPEech:S17D:FCH?
PROCedure:SCONfig:SCLass1:SPEech:S17D:FCH?
Radio Configuration

Returned value	Description of parameters	Def. value	Def. unit	FW vers.
Forward Radio Configuration,	2 to 5	2	–	V3.05
Forward Multiplex Option,	2 to 5	2	–	
Reverse Radio Configuration,	2 to 4	2	–	
Reverse Multiplex Option	2 to 4	2	–	

Description of command	Sig. State
This command is always a query. It returns the radio configuration and multiplex option of the forward and reverse fundamental traffic channel for service option 17. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.	See Descript.

CONFigure:SCONfig:SCLass1:SPEech:SX8T:FCH?
PROCedure:SCONfig:SCLass1:SPEech:SX8T:FCH?
Radio Configuration

Returned value	Description of parameters	Def. value	Def. unit	FW vers.
Forward Radio Configuration,	2 to 5	2	–	V3.05
Forward Multiplex Option,	2 to 5	2	–	
Reverse Radio Configuration,	2 to 4	2	–	
Reverse Multiplex Option	2 to 4	2	–	

Description of command	Sig. State
This command is always a query. It returns the radio configuration and multiplex option of the forward and reverse fundamental traffic channel for service option X8T. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.	See Descript.

CONFigure:SCONfig:SCLass1:SPEech:S01D:FCH:RC[?]
PROCedure:SCONfig:SCLass1:SPEech:S01D:FCH:RC[?]
<F_RC>*, *<R_RC>
Radio Configuration

<F_RC>	Description of parameters	Def. value	Def. unit	
1 to 4 | MINimum | MAXimum | DEFault,	Forward radio configuration Sets the value to the range minimum Sets the value to the range maximum Sets the value to the default setting	1	–	
<R_RC>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 3 | MINimum | MAXimum | DEFault	Reverse radio configuration Sets the value to the range minimum Sets the value to the range maximum Sets the value to the default setting	1	–	V3.05

Description of command	Sig. State
This command sets the radio configuration of the forward and reverse fundamental traffic channel for service option 01D. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.	See Descript.

CONFigure:SCONfig:SCLass1:SPEech:S03D:FCH:RC[?] Radio Configuration
PROCedure:SCONfig:SCLass1:SPEech:S03D:FCH:RC[?]
<F_RC>, <R_RC>

<F_RC>	Description of parameters	Def. value	Def. unit	
1 to 4 | MINimum | MAXimum | DEFault,	Forward radio configuration Sets the value to the range minimum Sets the value to the range maximum Sets the value to the default setting	1	–	
<R_RC>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 3 | MINimum | MAXimum | DEFault	Reverse radio configuration Sets the value to the range minimum Sets the value to the range maximum Sets the value to the default setting	1	–	V3.05

Description of command	Sig. State
This command sets the radio configuration of the forward and reverse fundamental traffic channel for service option 03. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.	See Descript.

CONFigure:SCONfig:SCLass1:SPEech:S17D:FCH:RC[?] Radio Configuration
PROCedure:SCONfig:SCLass1:SPEech:S17D:FCH:RC[?]
<F_RC>, <R_RC>

<F_RC>	Description of parameters	Def. value	Def. unit	
2 to 5 | MINimum | MAXimum | DEFault,	Forward radio configuration Sets the value to the range minimum Sets the value to the range maximum Sets the value to the default setting	2	–	
<R_RC>	Description of parameters	Def. value	Def. unit	FW vers.
2 to 4 | MINimum | MAXimum | DEFault	Reverse radio configuration Sets the value to the range minimum Sets the value to the range maximum Sets the value to the default setting	2	–	V3.05

Description of command	Sig. State
This command sets the radio configuration of the forward and reverse fundamental traffic channel for service option 17. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.	See Descript.

CONFigure:SCONfig:SCLass1:SPEech:SX8T:FCH:RC[?] Radio Configuration
PROCedure:SCONfig:SCLass1:SPEech:SX8T:FCH:RC[?]
<F_RC>, <R_RC>

<F_RC>	Description of parameters	Def. value	Def. unit	
2 to 5 |	Forward radio configuration	2	–	
MINimum |	Sets the value to the range minimum			
MAXimum |	Sets the value to the range maximum			
DEFault,	Sets the value to the default setting			

<R_RC>	Description of parameters	Def. value	Def. unit	FW vers.
2 to 4 |	Reverse radio configuration	2	–	V3.05
MINimum |	Sets the value to the range minimum			
MAXimum |	Sets the value to the range maximum			
DEFault	Sets the value to the default setting			

Description of command	Sig. State
This command sets the radio configuration of the forward and reverse fundamental traffic channel for service option X8T. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.	See Descript.

CONFigure:SCONfig:SCLass1:SPEech:S01D:VCODer[?] VoCoder
<VoCoder>

<VoCoder>	Description of parameters	Def. value	Def. unit	FW vers.
ECHO |	Loop back in the CMU with delay	ECHO	–	V3.05
V8 |	8K speech coder, amplified analog input signal			
V8Low |	8k speech coder			V3.10
CCAL |	Codec Cal.			
ECAL |	Encoder Cal.			
DCAL	Decoder Cal.			
DEFault	Use the default setting			

Description of command	Sig. State
This command configures how the CMU returns the data transmitted over the traffic channel to the mobile for service option 1. The delay time is set via `CONFigure:SCONfig:SCLass1:SPEech:S01D:EDELay`.	all

CONFigure:SCONfig:SCLass1:SPEech:S03D:VCODer[?] VoCoder
<VoCoder>

<VoCoder>	Description of parameters	Def. value	Def. unit	FW vers.
ECHO |	Loop back in the CMU with delay	ECHO	–	V3.05
V8E |	8K enhanced speech coder, amplified analog input signal			
V8ELow |	8k enhanced speech coder			V3.10
CCAL |	Codec Cal.			
ECAL |	Encoder Cal.			
DCAL |	Decoder Cal.			
DEFault	Use the default setting			

Description of command	Sig. State
This command configures how the CMU returns the data transmitted over the traffic channel to the mobile for service option 3. The delay time is set via `CONFigure:SCONfig:SCLass1:SPEech:S03D:EDELay`.	all

CONFigure:SCONfig:SCLass1:SPEech:S17D:VCODer[?] VoCoder
<VoCoder>

<VoCoder>	Description of parameters	Def. value	Def. unit	FW vers.
ECHO |	Loop back in the CMU with delay	ECHO	–	V3.05
V13 |	13K speech coder, amplified analog input signal			V3.20
V13Low |	13k speech coder			V3.20
CCAL |	Codec Cal.			V3.15
ECAL |	Encoder Cal.			V3.15
DCAL |	Decoder Cal.			V3.15
DEFault	Use the default setting			V3.15

Description of command	Sig. State
This command configures how the CMU returns the data transmitted over the traffic channel to the mobile for service option 17. The delay time is set via `CONFigure:SCONfig:SCLass1:SPEech:S17D:EDELay`.	all

CONFigure:SCONfig:SCLass1:SPEech:SX8T:VCODer[?] VoCoder
<VoCoder>

<VoCoder>	Description of parameters	Def. value	Def. unit	FW vers.
ECHO | DEFault	Loop back in the CMU with delay	ECHO	–	V3.05

Description of command	Sig. State
This command configures how the CMU returns the data transmitted over the traffic channel to the mobile for service option X8T. The delay time is set via `CONFigure:SCONfig:SCLass1:SPEech:SX8T:EDELay`.	all

CONFigure:SCONfig:SCLass1:SPEech:S01D:EDELay[?] Echo Delay
CONFigure:SCONfig:SCLass1:SPEech:S03D:EDELay[?]
CONFigure:SCONfig:SCLass1:SPEech:S17D:EDELay[?]
CONFigure:SCONfig:SCLass1:SPEech:SX8T:EDELay[?]
<Delay>

<Delay>	Description of parameters	Def. value	Def. unit	FW vers.
0.04 s to 5 s |	Delay before the received data is looped back	2.0	s	V3.08
MINimum |	Sets the value to the range minimum			
MAXimum |	Sets the value to the range maximum			
DEFault	Sets the value to the default setting			

Description of command	Sig. State
These commands define the time that the CMU waits before it loops back the received data if the *Voice Coder* is set to *Echo* mode. The four commands are valid for service options 1, 3, 17 and 0x800, respectively.	all

Subsytem SCONfig:SCLass:TDAT

The subsystem SCONfig:SCLass:TDAT defines the service options for the Test Data service type.

CONFigure:SCONfig:SCLass1:TDAT:SOPTion[?]
PROCedure:SCONfig:SCLass1:TDAT:SOPTion[?]
<Test Data Service Current Sel>

Test Data Service

<Test Data Service Current Sel>	Description of parameters	Def. value	Def. unit	FW vers.
S32D	Service Option 32	S32D	–	V3.05

Description of command	Sig. State
This command determines the service option to use when establishing a call in the test data mode, particularly for the high data rates using the supplemental channels (SCH). The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.	See Descript.

CONFigure:SCONfig:SCLass1:TDAT:S32D:FSCommon:RC[?]
PROCedure:SCONfig:SCLass1:TDAT:S32D:FSCommon:RC[?]
<F_RC>*, *<R_RC>

Radio Configuration

<F_RC>	Description of parameters	Def. value	Def. unit	
1 to 5 |	Forward radio configuration	1	–	
MINimum |	Sets the value to the range minimum			
MAXimum |	Sets the value to the range maximum			
DEFault,	Sets the value to the default setting			
<R_RC>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 5 |	Reverse radio configuration	1	–	V3.05
MINimum |	Sets the value to the range minimum			
MAXimum |	Sets the value to the range maximum			
DEFault	Sets the value to the default setting			

Description of command	Sig. State
This command sets a common radio configuration of the fundamental and supplemental forward and reverse traffic channel for service option 32. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.	See Descript.

CONFigure:SCONfig:SCLass1:TDAT:S32D:FCH?

Radio Configuration

Returned value	Description of parameters	Def. value	Def. unit	FW vers.
Forward Radio Configuration,	1 to 5	1	–	V3.05
Forward Multiplex Option,	1 to 5	1	–	
Reverse Radio Configuration,	1 to 5	1	–	
Reverse Multiplex Option	1 to 5	1	–	

Description of command	Sig. State
This command is always a query. It returns the radio configuration and multiplex option of the forward and reverse fundamental traffic channel for service option 32.	All

CONFigure:SCONfig:SCLass1:TDAT:S32D:FCH:FORWard:PGEN[?] Pattern Generation
<Pattern Generation>

<Pattern Generation>	Description of parameters	Def. Value	Def. Unit	FW vers.
RANDom | FIXed | DEFault	Random Fixed	RAND	–	V3.05

Description of command	Sig. State
This command sets the pattern generation for service option 32 to either a random or fixed pattern for the forward fundamental channel. If this command is set to FIXed, the pattern sent to the mobile station is defined with the command: `CONFigure:SCONfig:SCLass1:TDAT:S32D:FCH:FORWard:PATTern[?].`	All

CONFigure:SCONfig:SCLass1:TDAT:S32D:FCH:REVerse:PGEN[?] Pattern Generation
<Pattern Generation>

<Pattern Generation>	Description of parameters	Def. Value	Def. Unit	FW vers.
RANDom | FIXed | DEFault	Random Fixed	RAND	–	V3.05

Description of command	Sig. State
This command sets the pattern generation for service option 32 to either a random or fixed pattern for the reverse fundamental channel. If this command is set to FIXed, the pattern sent to the mobile station is defined with the command: `CONFigure:SCONfig:SCLass1:TDAT:S32D:FCH:FORWard:PATTern[?].`	All

CONFigure:SCONfig:SCLass1:TDAT:S32D:FCH:FORWard:PATTern[?] Pattern
<Pattern>

<Pattern>	Description of parameters	Def. Value	Def. Unit	FW vers.
{Hex value} | DEFault	Hex values for pattern generator	A5A5A5A5 A5A5A5A5	–	V3.05

Description of command	Sig. State
This command defines the pattern used by the pattern generator for service option 32. This pattern is used when the Pattern Generation is set to FIXed.	All

CONFigure:SCONfig:SCLass1:TDAT:S32D:FCH:REVerse:PATTern[?] Pattern
<Pattern>

<Pattern>	Description of parameters	Def. Value	Def. Unit	FW vers.
{Hex value} | DEFault	Hex values for pattern generator	A5A5A5A5 A5A5A5A5	–	V3.05

Description of command	Sig. State
This command defines the pattern used by the pattern generator for service option 32. This pattern is used when the Pattern Generation is set to FIXed.	All

CONFigure:SCONfig:SCLass1:TDAT:S32D:FCH:FORWard:CBFRames[?] Circular Buffer Frames
<Circular Buffer Frames>

<Circular Buffer Frames>	Description of parameters	Def. Value	Def. Unit	FW vers.
1 to 255	Forward circular buffer frames	2	–	V3.05

Description of command	Sig. State
This command sets the number of frames to use in the circular buffer of the forward fundmental channel when the random pattern is selected.	All

CONFigure:SCONfig:SCLass1:TDAT:S32D:FCH:REVerse:CBFRames[?] Circular Buffer Frames
<Circular Buffer Frames>

<Circular Buffer Frames>	Description of parameters	Def. Value	Def. Unit	FW vers.
1 to 255	Reverse circular buffer frames	2	–	V3.05

Description of command	Sig. State
This command sets the number of frames to use in the circular buffer of the reverse fundmental channel when the random pattern is selected.	All

CONFigure:SCONfig:SCLass1:TDAT:S32D:FCH:FORWard:TXON[?] Transmit On Period
<Transmit On Period>

<Transmit On Period>	Description of parameters	Def. Value	Def. Unit	FW vers.
0 to 255	Forward transmission on period	1	–	V3.05

Description of command	Sig. State
This command sets the transmission on period in frames of the forward fundamental channel when the frame activity is deterministic.	All

CONFigure:SCONfig:SCLass1:TDAT:S32D:FCH:REVerse:TXON[?] Transmit On Period
<Transmit On Period>

<Transmit On Period>	Description of parameters	Def. Value	Def. Unit	FW vers.
0 to 255	Reverse transmission on period	1	–	V3.05

Description of command	Sig. State
This command sets the transmission on period in frames of the reverse fundamental channel when the frame activity is deterministic.	All

CONFigure:SCONfig:SCLass1:TDAT:S32D:FCH:FORWard:TXOFf[?] Transmit Off Period
<Transmit Off Period>

<Transmit Off Period>	Description of parameters	Def. Value	Def. Unit	FW vers.
0 to 255	Forward transmission off period	0	–	V3.05

Description of command	Sig. State
This command sets the transmission off period in frames of the forward fundamental channel when the frame activity is deterministic.	All

CONFigure:SCONfig:SCLass1:TDAT:S32D:FCH:REVerse:TXOFf[?] *<Transmit Off Period>* Transmit Off Period

<Transmit Off Period>	Description of parameters	Def. Value	Def. Unit	FW vers.
0 to 255	Reverse transmission off period	0	–	V3.05

Description of command	Sig. State
This command sets the transmission off period in frames of the reverse fundamental channel when the frame activity is deterministic.	All

CONFigure:SCONfig:SCLass1:TDAT:S32D:SCH:ZERO:FORWard:ENABle[?] *<SCH0 Enable>* Forward SCH0 Enable

<SCH0 Enable>	Description of parameters	Def. Value	Def. Unit	FW vers.
ON | OFF	Enable or disable forward supplemental channel 0.	OFF	–	V3.05

Description of command	Sig. State
This command disables or enables the forward supplemental channel 0.	All

CONFigure:SCONfig:SCLass1:TDAT:S32D:SCH:ZERO:REVerse:ENABle[?] *<SCH0 Enable>* Reverse SCH0 Enable

<SCH0 Enable>	Description of parameters	Def. Value	Def. Unit	FW vers.
ON | OFF	Enable or disable reverse supplemental channel 0.	OFF	–	V3.05

Description of command	Sig. State
This command disables or enables the reverse supplemental channel 0.	All

CONFigure:SCONfig:SCLass1:TDAT:S32D:SCH:ZERO? Radio Configuration

Returned value	Description of parameters	Def. value	Def. unit	FW vers.
Forward Radio Configuration,	1 to 5	1	–	V3.05
Forward Multiplex Option,	1 to 5	1	–	
Reverse Radio Configuration,	1 to 5	1	–	
Reverse Multiplex Option	1 to 5	1	–	

Description of command	Sig. State
This command is always a query. It returns the radio configuration and multiplex option of the forward and reverse supplemental traffic channel 0 for service option 32.	All

CONFigure:SCONfig:SCLass1:TDAT:S32D:SCH:ZERO:FORWard:PGEN[?] *<Pattern Generation>* Pattern Generation

<Pattern Generation>	Description of parameters	Def. Value	Def. Unit	FW vers.
RANDom | FIXed | DEFault	Random Fixed	RAND	–	V3.05

Description of command	Sig. State
This command sets the pattern generation for service option 32 to either a random or fixed pattern for the forward fundamental channel. If this command is set to FIXed, the pattern sent to the mobile station is defined with the command: `CONFigure:SCONfig:SCLass1:TDAT:S32D:SCH:ZERO:FORWard:PATTern[?]`.	All

CONFigure:SCONfig:SCLass1:TDAT:S32D:SCH:ZERO:REVerse:PGEN[?] Pattern Generation
<Pattern Generation>

<Pattern Generation>	Description of parameters	Def. Value	Def. Unit	FW vers.
RANDom | FIXed | DEFault	Random Fixed	RAND	–	V3.05

Description of command	Sig. State
This command sets the pattern generation for service option 32 to either a random or fixed pattern for the reverse fundamental channel. If this command is set to FIXed, the pattern sent to the mobile station is defined with the command: `CONFigure:SCONfig:SCLass1:TDAT:S32D:SCH:ZERO:FORWard:PATTern[?].`	All

CONFigure:SCONfig:SCLass1:TDAT:S32D:SCH:ZERO:FORWard:PATTern[?] Pattern
<Pattern>

<Pattern>	Description of parameters	Def. Value	Def. Unit	FW vers.
{Hex value} | DEFault	Hex values for pattern generator	A5A5A5A5 A5A5A5A5	–	V3.05

Description of command	Sig. State
This command defines the pattern used by the pattern generator for service option 32. This pattern is used when the Pattern Generation is set to FIXed.	All

CONFigure:SCONfig:SCLass1:TDAT:S32D:SCH:ZERO:REVerse:PATTern[?] Pattern
<Pattern>

<Pattern>	Description of parameters	Def. Value	Def. Unit	FW vers.
{Hex value} | DEFault	Hex values for pattern generator	A5A5A5A5 A5A5A5A5	–	V3.05

Description of command	Sig. State
This command defines the pattern used by the pattern generator for service option 32. This pattern is used when the Pattern Generation is set to FIXed.	All

CONFigure:SCONfig:SCLass1:TDAT:S32D:SCH:ZERO:FORWard:CBFRames[?] Circular Buffer Frames
<Circular Buffer Frames>

<Circular Buffer Frames>	Description of parameters	Def. Value	Def. Unit	FW vers.
1 to 255	Forward circular buffer frames	2	–	V3.05

Description of command	Sig. State
This command sets the number of frames to use in the circular buffer of the forward supplemental channel 0 when the random pattern is selected.	All

CONFigure:SCONfig:SCLass1:TDAT:S32D:SCH:ZERO:REVerse:CBFRames[?] Circular Buffer Frames
<Circular Buffer Frames>

<Circular Buffer Frames>	Description of parameters	Def. Value	Def. Unit	FW vers.
1 to 255	Reverse circular buffer frames	2	–	V3.05

Description of command	Sig. State
This command sets the number of frames to use in the circular buffer of the reverse supplemental channel 0 when the random pattern is selected.	All

CONFigure:SCONfig:SCLass1:TDAT:S32D:SCH:ZERO:FORWard:TXON[?] Transmit On Period
<Transmit On Period>

<Transmit On Period>	Description of parameters	Def. Value	Def. Unit	FW vers.
0 to 255	Forward transmission on period	1	–	V3.05

Description of command	Sig. State
This command sets the transmission on period in frames of the forward supplemental channel 0 when the frame activity is deterministic.	All

CONFigure:SCONfig:SCLass1:TDAT:S32D:SCH:ZERO:REVerse:TXON[?] Transmit On Period
<Transmit On Period>

<Transmit On Period>	Description of parameters	Def. Value	Def. Unit	FW vers.
0 to 255	Reverse transmission on period	1	–	V3.05

Description of command	Sig. State
This command sets the transmission on period in frames of the reverse supplemental channel 0 when the frame activity is deterministic.	All

CONFigure:SCONfig:SCLass1:TDAT:S32D:SCH:ZERO:FORWard:TXOFf[?] Transmit Off Period
<Transmit Off Period>

<Transmit Off Period>	Description of parameters	Def. Value	Def. Unit	FW vers.
0 to 255	Forward transmission off period	0	–	V3.05

Description of command	Sig. State
This command sets the transmission off period in frames of the forward supplemental channel 0 when the frame activity is deterministic.	All

CONFigure:SCONfig:SCLass1:TDAT:S32D:SCH:ZERO:REVerse:TXOFf[?] Transmit Off Period
<Transmit Off Period>

<Transmit Off Period>	Description of parameters	Def. Value	Def. Unit	FW vers.
0 to 255	Reverse transmission off period	0	–	V3.05

Description of command	Sig. State
This command sets the transmission off period in frames of the reverse supplemental channel 0 when the frame activity is deterministic.	All

CONFigure:SCONfig:SCLass1:TDAT:S32D:SCH:ZERO:FORWard:MPPL[?] MuxPPL
<MuxPPL>

<MuxPPL>	Description of parameters	Def. Value	Def. Unit	FW vers.
1, 2, 4, 8	MuxPDUs per physical layer SDU	1	–	V3.05

Description of command	Sig. State
This command sets the MuxPDUs per physical layer SDU which is used to determine Multiplex Option and Data Rate of the forward supplemental channel 0. Refer to Table 6-1 and Table 6-2 on p. 6.59 about the relationship between MuxPPU, Frame Size, and Data Rate.	All

CONFigure:SCONfig:SCLass1:TDAT:S32D:SCH:ZERO:REVerse:MPPL[?] *<MuxPPL>*				MuxPPL
<MuxPPL>	Description of parameters	Def. Value	Def. Unit	FW vers.
1, 2, 4, 8	MuxPDUs per physical layer SDU	1	–	V3.05
Description of command				Sig. State
This command sets the MuxPDUs per physical layer SDU which is used to determine Multiplex Option and Data Rate of the reverse supplemental channel 0. Refer to Table 6-1 and Table 6-2 on p. 6.59 about the relationship between MuxPPU, Frame Size, and Data Rate.				All

Table 6-1: MuxPDUs per physical layer SDU

FSCHs are assigned W_n^N, where N = 4, 8, 16, 32, 64, 128, 128, and 128 for the maximum assigned QPSK symbol rate The maximum assigned QPSK symbol rate depends on the radio class, frame size, and multiplex option. The multiplex option depends on the frame type (Rate 1, Rate 2, or Rate 3) and MuxPDUs per physical layer SDU. Any QOF may be used. The following table illustrates the Walsh selection versus the combinations of these parameters:

MuxPDUs per physical layer SDU			Frame Size								
Frame Type			RC3			RC4			RC5		
Rate 1	Rate 2	Rate 3	20 ms	40 ms	80 ms	20 ms	40 ms	80 ms	20 ms	40 ms	80 ms
1			W_n^{64}	W_n^{128}	W_n^{128}	W_n^{128}	W_n^{128}	W_n^{128}	W_n^{64}	W_n^{128}	W_n^{128}
2	1		W_n^{32}	W_n^{64}	W_n^{128}	W_n^{64}	W_n^{128}	W_n^{128}	W_n^{32}	W_n^{64}	W_n^{128}
4	2		W_n^{16}	W_n^{32}	W_n^{64}	W_n^{32}	W_n^{64}	W_n^{128}	W_n^{16}	W_n^{32}	W_n^{64}
8	4		W_n^{8}	W_n^{16}	W_n^{32}	W_n^{16}	W_n^{32}	W_n^{64}	W_n^{8}	W_n^{16}	W_n^{32}
	8		W_n^{4}	W_n^{8}	W_n^{16}	W_n^{8}	W_n^{16}	W_n^{32}	W_n^{4}	W_n^{8}	W_n^{16}
		1				W_n^{4}	W_n^{8}	W_n^{16}			

Table 6-2: MuxPDUs per Physical Layer per Data Rate

MuxPDUs per Physical Layer SDU	Data Rate (kbps)					
	F-SCH RC=3, 4 R-SCH RC=3			F-SCH RC=5 R-SCH RC=4		
	Frame Type			Frame Type		
	Rate 1	Rate 2	Rate 3	Rate 1	Rate 2	Rate 3
1	9.6	19.2		14.4	28.8	
2	19.2	38.4		28.8	57.6	
4	38.4	76.8		57.6	115.2	
8	76.8	153.6		115.2	230.4	
-			307.2			-

CONFigure:SCONfig:SCLass1:TDAT:S32D:SCH:ZERO:FORWard:FRTYpe[?] ***<Frame Type>***				Frame Type
<Frame Type>	Description of parameters	Def. Value	Def. Unit	FW vers.
1 to 2	Frame type for forward supplemental channel 0.	1	–	V3.05
Description of command				Sig. State
This command sets the frame type used for the forward supplemental channel 0 to determine the Multiplex Option and Data Rate.				All

CONFigure:SCONfig:SCLass1:TDAT:S32D:SCH:ZERO:REVerse:FRTYpe[?] ***<Frame Type>***				Frame Type
<Frame Type>	Description of parameters	Def. Value	Def. Unit	FW vers.
1 to 2	Frame type for reverse supplemental channel 0.	1	–	V3.05
Description of command				Sig. State
This command sets the frame type used for the reverse supplemental channel 0 to determine the Multiplex Option and Data Rate.				All

CONFigure:SCONfig:SCLass1:PDAT:S32D:SCH:ZERO:FORWard:CODing ***<Coding>***				Coding, Forward
<Coding>, settings	Description of parameters	Def. Value	Def. Unit	FW vers.
CONV | TURBo	Convolutional encoding Turbo encoding	CONV	–	V3.40
<Coding>, query (additional)	Description of parameters	Def. Value	Def. Unit	FW vers.
CTIP	Convolutional (Turbo if possible)	–	–	V3.40
Description of command				Sig. State
This command selects the coding method of the forward supplemental channel 0. *CTIP* is not a setting parameter: It indicates that convolutional coding is used because turbo coding is not supported for the selected data rate of 9.6 kbps. Turbo encoding will be used as soon as the data rate is increased beyond 9.6 kbps.				All

CONFigure:SCONfig:SCLass1:PDAT:S32D:SCH:ZERO:REVerse:CODing ***<Coding>***				Coding, Reverse
<Coding>, settings	Description of parameters	Def. Value	Def. Unit	FW vers.
CONV | TURBo	Convolutional encoding Turbo encoding	CONV	–	V3.40
<Coding>, query (additional)	Description of parameters	Def. Value	Def. Unit	FW vers.
CTIP	Convolutional (Turbo if possible)	–	–	V3.40
Description of command				Sig. State
This command selects the coding method of the reverse supplemental channel 0. *CTIP* is not a setting parameter: It indicates that convolutional coding is used because turbo coding is not supported for the selected data rate of 9.6 kbps. Turbo encoding will be used as soon as the data rate is increased beyond 9.6 kbps.				All

CONFigure:SCONfig:SCLass1:TDAT:S32D:SCH:ZERO:FORWard:DRATe? ***<Data Rate>***				Data Rate
<Data Rate>	Description of parameters	Def. Value	Def. Unit	FW vers.
9.6 to 153.6	Forward supplemental channel 0 data rate	–	kbps	V3.05
Description of command				Sig. State
This command is always a query. It returns the data rate of the forward supplemental channel 0. The data rate is dependent on the Radio Configuration, MuxPDUs per Physical Layer SDU, and Frame Type.				All

CONFigure:SCONfig:SCLass1:TDAT:S32D:SCH:ZERO:REVerse:DRATe? ***<Data Rate>***				Data Rate
<Data Rate>	Description of parameters	Def. Value	Def. Unit	FW vers.
9.6 to 153.6	Reverse supplemental channel 0 data rate	–	kbps	V3.05
Description of command				Sig. State
This command is always a query. It returns the data rate of the reverse supplemental channel 0. The data rate is dependent on the Radio Configuration, MuxPDUs per Physical Layer SDU, and Frame Type.				All

CONFigure:SCONfig:SCLass1:TDAT:S32D:SCH:ONE:FORWard:ENABle[?] ***<SCH1 Enable>***				Forward SCH1 Enable
<SCH1 Enable>	Description of parameters	Def. Value	Def. Unit	FW vers.
ON | OFF	Enable or disable forward supplemental channel 1.	OFF	–	V3.20
Description of command				Sig. State
This command disables or enables the forward supplemental channel 1.				All

CONFigure:SCONfig:SCLass1:TDAT:S32D:SCH:ONE:REVerse:ENABle[?] ***<SCH1 Enable>***				Reverse SCH1 Enable
<SCH1 Enable>	Description of parameters	Def. Value	Def. Unit	FW vers.
ON | OFF	Enable or disable reverse supplemental channel 1.	OFF	–	V3.20
Description of command				Sig. State
This command disables or enables the reverse supplemental channel 1.				All

CONFigure:SCONfig:SCLass1:TDAT:S32D:SCH:ONE?				Radio Configuration
Returned value	Description of parameters	Def. value	Def. unit	FW vers.
Forward Radio Configuration,	1 to 5	1	–	V3.20
Forward Multiplex Option,	1 to 5	1	–	
Reverse Radio Configuration,	1 to 5	1	–	
Reverse Multiplex Option	1 to 5	1	–	
Description of command				Sig. State
This command is always a query. It returns the radio configuration and multiplex option of the forward and reverse supplemental traffic channel 1 for service option 32.				All

CONFigure:SCONfig:SCLass1:TDAT:S32D:SCH:ONE:FORWard:PGEN[?] Pattern Generation
<Pattern Generation>

<Pattern Generation>	Description of parameters	Def. Value	Def. Unit	FW vers.
RANDom | FIXed | DEFault	Random Fixed	RAND	–	V3.20

Description of command	Sig. State
This command sets the pattern generation for service option 32 to either a random or fixed pattern for the forward fundamental channel. If this command is set to FIXed, the pattern sent to the mobile station is defined with the command: `CONFigure:SCONfig:SCLass1:TDAT:S32D:SCH:ONE:FORWard:PATTern[?].`	All

CONFigure:SCONfig:SCLass1:TDAT:S32D:SCH:ONE:REVerse:PGEN[?] Pattern Generation
<Pattern Generation>

<Pattern Generation>	Description of parameters	Def. Value	Def. Unit	FW vers.
RANDom | FIXed | DEFault	Random Fixed	RAND	–	V3.20

Description of command	Sig. State
This command sets the pattern generation for service option 32 to either a random or fixed pattern for the reverse fundamental channel. If this command is set to FIXed, the pattern sent to the mobile station is defined with the command: `CONFigure:SCONfig:SCLass1:TDAT:S32D:SCH:ONE:FORWard:PATTern[?].`	All

CONFigure:SCONfig:SCLass1:TDAT:S32D:SCH:ONE:FORWard:PATTern[?] Pattern
<Pattern>

<Pattern>	Description of parameters	Def. Value	Def. Unit	FW vers.
{Hex value} | DEFault	Hex values for pattern generator	A5A5A5A5 A5A5A5A5	–	V3.20

Description of command	Sig. State
This command defines the pattern used by the pattern generator for service option 32. This pattern is used when the Pattern Generation is set to FIXed.	All

CONFigure:SCONfig:SCLass1:TDAT:S32D:SCH:ONE:REVerse:PATTern[?] Pattern
<Pattern>

<Pattern>	Description of parameters	Def. Value	Def. Unit	FW vers.
{Hex value} | DEFault	Hex values for pattern generator	A5A5A5A5 A5A5A5A5	–	V3.20

Description of command	Sig. State
This command defines the pattern used by the pattern generator for service option 32. This pattern is used when the Pattern Generation is set to FIXed.	All

CONFigure:SCONfig:SCLass1:TDAT:S32D:SCH:ONE:FORWard:CBFRames[?] ***<Circular Buffer Frames>***				Circular Buffer Frames
<Circular Buffer Frames>	Description of parameters	Def. Value	Def. Unit	FW vers.
1 to 255	Forward circular buffer frames	2	–	V3.20
Description of command				Sig. State
This command sets the number of frames to use in the circular buffer of the forward supplemental channel 1 when the random pattern is selected.				All

CONFigure:SCONfig:SCLass1:TDAT:S32D:SCH:ONE:REVerse:CBFRames[?] ***<Circular Buffer Frames>***				Circular Buffer Frames
<Circular Buffer Frames>	Description of parameters	Def. Value	Def. Unit	FW vers.
1 to 255	Reverse circular buffer frames	2	–	V3.20
Description of command				Sig. State
This command sets the number of frames to use in the circular buffer of the reverse supplemental channel 1 when the random pattern is selected.				All

CONFigure:SCONfig:SCLass1:TDAT:S32D:SCH:ONE:FORWard:TXON[?] ***<Transmit On Period>***				Transmit On Period
<Transmit On Period>	Description of parameters	Def. Value	Def. Unit	FW vers.
0 to 255	Forward transmission on period	1	–	V3.20
Description of command				Sig. State
This command sets the transmission on period in frames of the forward supplemental channel 1 when the frame activity is deterministic.				All

CONFigure:SCONfig:SCLass1:TDAT:S32D:SCH:ONE:REVerse:TXON[?] ***<Transmit On Period>***				Transmit On Period
<Transmit On Period>	Description of parameters	Def. Value	Def. Unit	FW vers.
0 to 255	Reverse transmission on period	1	–	V3.20
Description of command				Sig. State
This command sets the transmission on period in frames of the reverse supplemental channel 1 when the frame activity is deterministic.				All

CONFigure:SCONfig:SCLass1:TDAT:S32D:SCH:ONE:FORWard:TXOFf[?] ***<Transmit Off Period>***				Transmit Off Period
<Transmit Off Period>	Description of parameters	Def. Value	Def. Unit	FW vers.
0 to 255	Forward transmission off period	0	–	V3.20
Description of command				Sig. State
This command sets the transmission off period in frames of the forward supplemental channel 1 when the frame activity is deterministic.				All

CONFigure:SCONfig:SCLass1:TDAT:S32D:SCH:ONE:REVerse:TXOFf[?] ***<Transmit Off Period>***				Transmit Off Period
<Transmit Off Period>	Description of parameters	Def. Value	Def. Unit	FW vers.
0 to 255	Reverse transmission off period	0	–	V3.20
Description of command				Sig. State
This command sets the transmission off period in frames of the reverse supplemental channel 1 when the frame activity is deterministic.				All

CONFigure:SCONfig:SCLass1:TDAT:S32D:SCH:ONE:FORWard:MPPL[?] MuxPPL
<MuxPPL>

<MuxPPL>	Description of parameters	Def. Value	Def. Unit	FW vers.
1, 2, 4, 8	MuxPDUs per physical layer SDU	1	–	V3.20

Description of command	Sig. State
This command sets the MuxPDUs per physical layer SDU which is used to determine Multiplex Option and Data Rate of the forward supplemental channel 1. Refer to Table 6-1 and Table 6-2 on p. 6.59 about the relationship between MuxPPU, Frame Size, and Data Rate.	All

CONFigure:SCONfig:SCLass1:TDAT:S32D:SCH:ONE:REVerse:MPPL[?] MuxPPL
<MuxPPL>

<MuxPPL>	Description of parameters	Def. Value	Def. Unit	FW vers.
1, 2, 4, 8	MuxPDUs per physical layer SDU	1	–	V3.20

Description of command	Sig. State
This command sets the MuxPDUs per physical layer SDU which is used to determine Multiplex Option and Data Rate of the reverse supplemental channel 1. Refer to Table 6-1 and Table 6-2 on p. 6.59 about the relationship between MuxPPU, Frame Size, and Data Rate.	All

CONFigure:SCONfig:SCLass1:TDAT:S32D:SCH:ONE:FORWard:FRTYpe[?] Frame Type
<Frame Type>

<Frame Type>	Description of parameters	Def. Value	Def. Unit	FW vers.
1 to 2	Frame type for forward supplemental channel 1.	1	–	V3.20

Description of command	Sig. State
This command sets the frame type used for the forward supplemental channel 1 to determine the Multiplex Option and Data Rate.	All

CONFigure:SCONfig:SCLass1:TDAT:S32D:SCH:ONE:REVerse:FRTYpe[?] Frame Type
<Frame Type>

<Frame Type>	Description of parameters	Def. Value	Def. Unit	FW vers.
1 to 2	Frame type for reverse supplemental channel 1.	1	–	V3.20

Description of command	Sig. State
This command sets the frame type used for the reverse supplemental channel 1 to determine the Multiplex Option and Data Rate.	All

CONFigure:SCONfig:SCLass1:PDAT:S32D:SCH:ONE:FORWard:CODing Coding, Forward
<Coding>

<Coding>, settings	Description of parameters	Def. Value	Def. Unit	FW vers.
CONV | TURBo	Convolutional encoding Turbo encoding	CONV	–	V3.40
<Coding>, query (additional)	Description of parameters	Def. Value	Def. Unit	FW vers.
CTIP	Convolutional (Turbo if possible)	–	–	V3.40

Description of command	Sig. State
This command selects the coding method of the forward supplemental channel 1. *CTIP* is not a setting parameter: It indicates that convolutional coding is used because turbo coding is not supported for the selected data rate of 9.6 kbps. Turbo encoding will be used as soon as the data rate is increased beyond 9.6 kbps.	All

CONFigure:SCONfig:SCLass1:PDAT:S32D:SCH:ONE:REVerse:CODing ***<Coding>***				Coding, Reverse
<Coding>, settings	Description of parameters	Def. Value	Def. Unit	FW vers.
CONV | TURBo	Convolutional encoding Turbo encoding	CONV	–	V3.40
<Coding>, query (additional)	Description of parameters	Def. Value	Def. Unit	FW vers.
CTIP	Convolutional (Turbo if possible)	–	–	V3.40
Description of command				Sig. State
This command selects the coding method of the reverse supplemental channel 1. *CTIP* is not a setting parameter: It indicates that convolutional coding is used because turbo coding is not supported for the selected data rate of 9.6 kbps. Turbo encoding will be used as soon as the data rate is increased beyond 9.6 kbps.				All

CONFigure:SCONfig:SCLass1:TDAT:S32D:SCH:ONE:FORWard:DRATe? ***<Data Rate>***				Data Rate
<Data Rate>	Description of parameters	Def. Value	Def. Unit	FW vers.
9.6 to 153.6	Forward supplemental channel 1 data rate	–	kbps	V3.20
Description of command				Sig. State
This command is always a query. It returns the data rate of the forward supplemental channel 1. The data rate is dependent on the Radio Configuration, MuxPDUs per Physical Layer SDU, and Frame Type.				All

CONFigure:SCONfig:SCLass1:TDAT:S32D:SCH:ONE:REVerse:DRATe? ***<Data Rate>***				Data Rate
<Data Rate>	Description of parameters	Def. Value	Def. Unit	FW vers.
9.6 to 153.6	Reverse supplemental channel 1 data rate	–	kbps	V3.20
Description of command				Sig. State
This command is always a query. It returns the data rate of the reverse supplemental channel 1. The data rate is dependent on the Radio Configuration, MuxPDUs per Physical Layer SDU, and Frame Type.				All

Subsystem SCONfig:SCLass:PDAT

The subsystem `SCONfig:SCLass:PDAT` defines the service options for the Packet Data service type.

CONFigure:SCONfig:SCLass1:PDAT:SOPTion[?] **PROCedure:SCONfig:SCLass1:PDAT:SOPTion[?]** ***<Test Data Service Current Sel>***				Packet Data Service
<Test Data Service Current Sel>	Description of parameters	Def. value	Def. unit	FW vers.
S33D	Service Option 33	S33D	–	V3.20
Description of command				Sig. State
This command determines the service option to use when establishing a call in the test data mode, particularly for the high data rates using the supplemental channels (SCH). The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.				See Descript.

CONFigure:SCONfig:SCLass1:PDAT:S33D:FSCommon:RC[?]
PROCedure:SCONfig:SCLass1:PDAT:S33D:FSCommon:RC[?]
<F_RC>, <R_RC>

Radio Configuration

<F_RC>	Description of parameters	Def. value	Def. unit	
1 to 5 | MINimum | MAXimum | DEFault,	Forward radio configuration Sets the value to the range minimum Sets the value to the range maximum Sets the value to the default setting	1	–	
<R_RC>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 5 | MINimum | MAXimum | DEFault	Reverse radio configuration Sets the value to the range minimum Sets the value to the range maximum Sets the value to the default setting	1	–	V3.20

Description of command	Sig. State
This command sets a common radio configuration of the fundamental and supplemental forward and reverse traffic channel for service option 33. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.	See Descript.

CONFigure:SCONfig:SCLass1:PDAT:S33D:FCH?

Radio Configuration

Returned value	Description of parameters	Def. value	Def. unit	FW vers.
Forward Radio Configuration,	1 to 5	1	–	V3.20
Forward Multiplex Option,	1 to 5	1	–	
Reverse Radio Configuration,	1 to 5	1	–	
Reverse Multiplex Option	1 to 5	1	–	

Description of command	Sig. State
This command is always a query. It returns the radio configuration and multiplex option of the forward and reverse fundamental traffic channel for service option 33.	All

CONFigure:SCONfig:SCLass1:PDAT:S33D:SCH:ZERO:FORWard:ENABle[?]
<SCH0 Enable>

Forward SCH0 Enable

<SCH0 Enable>	Description of parameters	Def. Value	Def. Unit	FW vers.
ON | OFF	Enable or disable forward supplemental channel 0.	OFF	–	V3.20

Description of command	Sig. State
This command disables or enables the forward supplemental channel 0.	All

CONFigure:SCONfig:SCLass1:PDAT:S33D:SCH:ZERO:REVerse:ENABle[?]
<SCH0 Enable>

Reverse SCH0 Enable

<SCH0 Enable>	Description of parameters	Def. Value	Def. Unit	FW vers.
ON | OFF	Enable or disable reverse supplemental channel 0.	OFF	–	V3.20

Description of command	Sig. State
This command disables or enables the reverse supplemental channel 0.	All

CONFigure:SCONfig:SCLass1:PDAT:S33D:SCH:ZERO? Radio Configuration

Returned value	Description of parameters	Def. value	Def. unit	FW vers.
Forward Radio Configuration,	1 to 5	1	–	V3.20
Forward Multiplex Option,	1 to 5	1	–	
Reverse Radio Configuration,	1 to 5	1	–	
Reverse Multiplex Option	1 to 5	1	–	

Description of command	Sig. State
This command is always a query. It returns the radio configuration and multiplex option of the forward and reverse supplemental traffic channel 0 for service option 33.	All

CONFigure:SCONfig:SCLass1:PDAT:S33D:SCH:ZERO:FORWard:MPPL[?] *<MuxPPL>* MuxPPL

<MuxPPL>	Description of parameters	Def. Value	Def. Unit	FW vers.
1, 2, 4, 8	MuxPDUs per physical layer SDU	1	–	V3.20

Description of command	Sig. State
This command sets the MuxPDUs per physical layer SDU which is used to determine Multiplex Option and Data Rate of the forward supplemental channel 0. Refer to Table 6-1 and Table 6-2 on p. 6.59 about the relationship between MuxPPU, Frame Size, and Data Rate.	All

CONFigure:SCONfig:SCLass1:PDAT:S33D:SCH:ZERO:REVerse:MPPL[?] *<MuxPPL>* MuxPPL

<MuxPPL>	Description of parameters	Def. Value	Def. Unit	FW vers.
1, 2, 4, 8	MuxPDUs per physical layer SDU	1	–	V3.20

Description of command	Sig. State
This command sets the MuxPDUs per physical layer SDU which is used to determine Multiplex Option and Data Rate of the reverse supplemental channel 0. Refer to Table 6-1 and Table 6-2 on p. 6.59 about the relationship between MuxPPU, Frame Size, and Data Rate.	All

CONFigure:SCONfig:SCLass1:PDAT:S33D:SCH:ZERO:FORWard:FRTYpe[?] *<Frame Type>* Frame Type

<Frame Type>	Description of parameters	Def. Value	Def. Unit	FW vers.
1 to 2	Frame type for forward supplemental channel 0.	1	–	V3.20

Description of command	Sig. State
This command sets the frame type used for the forward supplemental channel 0 to determine the Multiplex Option and Data Rate.	All

CONFigure:SCONfig:SCLass1:PDAT:S33D:SCH:ZERO:REVerse:FRTYpe[?] *<Frame Type>* Frame Type

<Frame Type>	Description of parameters	Def. Value	Def. Unit	FW vers.
1 to 2	Frame type for reverse supplemental channel 0.	1	–	V3.20

Description of command	Sig. State
This command sets the frame type used for the reverse supplemental channel 0 to determine the Multiplex Option and Data Rate.	All

CONFigure:SCONfig:SCLass1:PDAT:S33D:SCH:ZERO:FORWard:CODing Coding, Forward
<Coding>

<Coding>, settings	Description of parameters	Def. Value	Def. Unit	FW vers.
CONV | TURBo	Convolutional encoding Turbo encoding	CONV	–	V3.40
<Coding>, query (additional)	Description of parameters	Def. Value	Def. Unit	FW vers.
CTIP	Convolutional (Turbo if possible)	–	–	V3.40

Description of command	Sig. State
This command selects the coding method of the forward supplemental channel 0. *CTIP* is not a setting parameter: It indicates that convolutional coding is used because turbo coding is not supported for the selected data rate of 9.6 kbps. Turbo encoding will be used as soon as the data rate is increased beyond 9.6 kbps.	All

CONFigure:SCONfig:SCLass1:PDAT:S33D:SCH:ZERO:REVerse:CODing Coding, Reverse
<Coding>

<Coding>, settings	Description of parameters	Def. Value	Def. Unit	FW vers.
CONV | TURBo	Convolutional encoding Turbo encoding	CONV	–	V3.40
<Coding>, query (additional)	Description of parameters	Def. Value	Def. Unit	FW vers.
CTIP	Convolutional (Turbo if possible)	–	–	V3.40

Description of command	Sig. State
This command selects the coding method of the reverse supplemental channel 0. *CTIP* is not a setting parameter: It indicates that convolutional coding is used because turbo coding is not supported for the selected data rate of 9.6 kbps. Turbo encoding will be used as soon as the data rate is increased beyond 9.6 kbps.	All

CONFigure:SCONfig:SCLass1:PDAT:S33D:SCH:ZERO:FORWard:DRATe? Data Rate
<Data Rate>

<Data Rate>	Description of parameters	Def. Value	Def. Unit	FW vers.
9.6 to 153.6	Forward supplemental channel 0 data rate	–	kbps	V3.20

Description of command	Sig. State
This command is always a query. It returns the data rate of the forward supplemental channel 0. The data rate is dependent on the Radio Configuration, MuxPDUs per Physical Layer SDU, and Frame Type.	All

CONFigure:SCONfig:SCLass1:PDAT:S33D:SCH:ZERO:REVerse:DRATe? Data Rate
<Data Rate>

<Data Rate>	Description of parameters	Def. Value	Def. Unit	FW vers.
9.6 to 153.6	Reverse supplemental channel 0 data rate	–	kbps	V3.20

Description of command	Sig. State
This command is always a query. It returns the data rate of the reverse supplemental channel 0. The data rate is dependent on the Radio Configuration, MuxPDUs per Physical Layer SDU, and Frame Type.	All

CONFigure:SCONfig:SCLass1:PDAT:S33D:SCH:ONE:FORWard:ENABle[?] Forward SCH1 Enable
<SCH1 Enable>

<SCH1 Enable>	Description of parameters	Def. Value	Def. Unit	FW vers.
ON | OFF	Enable or disable forward supplemental channel 1.	OFF	–	V3.20

Description of command	Sig. State
This command disables or enables the forward supplemental channel 1.	All

CONFigure:SCONfig:SCLass1:PDAT:S33D:SCH:ONE:REVerse:ENABle[?] Reverse SCH1 Enable
<SCH1 Enable>

<SCH1 Enable>	Description of parameters	Def. Value	Def. Unit	FW vers.
ON | OFF	Enable or disable reverse supplemental channel 1.	OFF	–	V3.20

Description of command	Sig. State
This command disables or enables the reverse supplemental channel 1.	All

CONFigure:SCONfig:SCLass1:PDAT:S33D:SCH:ONE? Radio Configuration

Returned value	Description of parameters	Def. value	Def. unit	FW vers.
Forward Radio Configuration,	1 to 5	1	–	V3.20
Forward Multiplex Option,	1 to 5	1	–	
Reverse Radio Configuration,	1 to 5	1	–	
Reverse Multiplex Option	1 to 5	1	–	

Description of command	Sig. State
This command is always a query. It returns the radio configuration and multiplex option of the forward and reverse supplemental traffic channel 1 for service option 33.	All

CONFigure:SCONfig:SCLass1:PDAT:S33D:SCH:ONE:FORWard:MPPL[?] MuxPPL
<MuxPPL>

<MuxPPL>	Description of parameters	Def. Value	Def. Unit	FW vers.
1, 2, 4, 8	MuxPDUs per physical layer SDU	1	–	V3.20

Description of command	Sig. State
This command sets the MuxPDUs per physical layer SDU which is used to determine Multiplex Option and Data Rate of the forward supplemental channel 1. Refer to *Table 6-1* and *Table 6-2* on p. 6.59 about the relationship between MuxPPU, Frame Size, and Data Rate.	All

CONFigure:SCONfig:SCLass1:PDAT:S33D:SCH:ONE:REVerse:MPPL[?] MuxPPL
<MuxPPL>

<MuxPPL>	Description of parameters	Def. Value	Def. Unit	FW vers.
1, 2, 4, 8	MuxPDUs per physical layer SDU	1	–	V3.20

Description of command	Sig. State
This command sets the MuxPDUs per physical layer SDU which is used to determine Multiplex Option and Data Rate of the reverse supplemental channel 1. Refer to *Table 6-1* and *Table 6-2* on p. 6.59 about the relationship between MuxPPU, Frame Size, and Data Rate.	All

CONFigure:SCONfig:SCLass1:PDAT:S33D:SCH:ONE:FORWard:FRTYpe[?] Frame Type
<Frame Type>

<Frame Type>	Description of parameters	Def. Value	Def. Unit	FW vers.
1 to 2	Frame type for forward supplemental channel 1.	1	–	V3.20
Description of command				Sig. State
This command sets the frame type used for the forward supplemental channel 1 to determine the Multiplex Option and Data Rate.				All

CONFigure:SCONfig:SCLass1:PDAT:S33D:SCH:ONE:REVerse:FRTYpe[?] Frame Type
<Frame Type>

<Frame Type>	Description of parameters	Def. Value	Def. Unit	FW vers.
1 to 2	Frame type for reverse supplemental channel 1.	1	–	V3.20
Description of command				Sig. State
This command sets the frame type used for the reverse supplemental channel 1 to determine the Multiplex Option and Data Rate.				All

CONFigure:SCONfig:SCLass1:PDAT:S33D:SCH:ONE:FORWard:CODing Coding, Forward
<Coding>

<Coding>, settings	Description of parameters	Def. Value	Def. Unit	FW vers.
CONV | TURBo	Convolutional encoding Turbo encoding	CONV	–	V3.40
<Coding>, query (additional)	Description of parameters	Def. Value	Def. Unit	FW vers.
CTIP	Convolutional (Turbo if possible)	–	–	V3.40
Description of command				Sig. State
This command selects the coding method of the forward supplemental channel 1. *CTIP* is not a setting parameter: It indicates that convolutional coding is used because turbo coding is not supported for the selected data rate of 9.6 kbps. Turbo encoding will be used as soon as the data rate is increased beyond 9.6 kbps.				All

CONFigure:SCONfig:SCLass1:PDAT:S33D:SCH:ONE:REVerse:CODing Coding, Reverse
<Coding>

<Coding>, settings	Description of parameters	Def. Value	Def. Unit	FW vers.
CONV | TURBo	Convolutional encoding Turbo encoding	CONV	–	V3.40
<Coding>, query (additional)	Description of parameters	Def. Value	Def. Unit	FW vers.
CTIP	Convolutional (Turbo if possible)	–	–	V3.40
Description of command				Sig. State
This command selects the coding method of the reverse supplemental channel 1. *CTIP* is not a setting parameter: It indicates that convolutional coding is used because turbo coding is not supported for the selected data rate of 9.6 kbps. Turbo encoding will be used as soon as the data rate is increased beyond 9.6 kbps.				All

CONFigure:SCONfig:SCLass1:PDAT:S33D:SCH:ONE:FORWard:DRATe? Data Rate
<Data Rate>

<Data Rate>	Description of parameters	Def. Value	Def. Unit	FW vers.
9.6 to 153.6	Forward supplemental channel 1 data rate	–	kbps	V3.20

Description of command	Sig. State
This command is always a query. It returns the data rate of the forward supplemental channel 1. The data rate is dependent on the Radio Configuration, MuxPDUs per Physical Layer SDU, and Frame Type.	All

CONFigure:SCONfig:SCLass1:PDAT:S33D:SCH:ONE:REVerse:DRATe? Data Rate
<Data Rate>

<Data Rate>	Description of parameters	Def. Value	Def. Unit	FW vers.
9.6 to 153.6	Reverse supplemental channel 1 data rate	–	kbps	V3.20

Description of command	Sig. State
This command is always a query. It returns the data rate of the reverse supplemental channel 1. The data rate is dependent on the Radio Configuration, MuxPDUs per Physical Layer SDU, and Frame Type.	All

CONFigure:SCONfig:SCLass1:PDAT:S33D:REVerse:IPADdress IP Address
CONFigure:SCONfig:SCLass1:PDAT:S33D:FORWard:IPADdress
<Addr_1>, <Addr_2>, <Addr_3>, <Addr_4>

Address parts	Ranges of values	Def. value	Def. unit	FW vers.
<Addr_1>,	0 to 255	192	–	V3.20
<Addr_2>,	0 to 255	168	–	
<Addr_3>,	0 to 255	1	–	
<Addr_4>	0 to 255	1 (for reverse address) 2 (for forward address)	– –	

Description of command	Sig. State
This command defines the IP address of the MS `(:REVerse)` and the BS/CMU `(:FORWard)`.	all

Subsytem SCONfig:SCLass:WMT

The subsystem SCONfig:SCLass:WMT:SMS defines the parameters for the Wireless Messaging Teleservice. It corresponds to the *Messaging Teleservice (WMT)* section in the *Service Cfg.* tab of the *Connection Control* menu.

CONFigure:SCONfig:SCLass1:WMT:SOPTion? Selected Service Option
<WMT_Current>

<WMT_Current>	Description of parameters	Def. value	Def. unit	FW vers.
S06D | CCON	Service Option 6 (SMS) for SMS from SON or REG SMS @ Current Connection for SMS from CONN	S06D	–	V3.10

Description of command	Sig. State
This command is always a query. It returns the service option selected for the Messaging Teleservice.	All

CONFigure:SCONfig:SCLass1:WMT:SMS:ACKNowledge:ENABle[?] <Enable> Acknowledge

<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | OFF	Enable or disable acknowledgement of short messages	ON	–	V3.10

Description of command	Sig. State
This command qualifies whether the mobile shall acknowledge the received short message.	All

CONFigure:SCONfig:SCLass1:WMT:SMS:TSTamp:ENABle[?] <Enable> Add Time Stamp

<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | OFF	Add or omit time stamp	ON	–	V3.10

Description of command	Sig. State
This command qualifies whether a time stamp is added when the short message is sent to the MS.	All

CONFigure:SCONfig:SCLass1:WMT:SMS:TEXT[?] Outgoing SMS

Returns	Description of parameters	Def. value	Def. unit	FW vers.
"<max. 152 7-bit ASCII characters>"	SMS text	"–"	–	V3.10

Description of command	Sig. State
This command defines the text of the short message to be sent to the MS. The number of characters is limited to 152 because 8 characters are reserved for the optional time stamp.	All

CONFigure:SCONfig:SCLass1:WMT:S06D:FCH? FCH Config.

Returns	Description of parameters	Def. value	Def. unit	FW vers.
1 to 4, 1, 1 to 3, 1	F_FCH_RC, forward Radio Configuration F_FCH_MO, forward Multiplex Option R_FCH_RC, reverse Radio Configuration R_FCH_MO, reverse Multiplex Option	1 1 1 1	– – – –	V3.10

Description of command	Sig. State
This command is always a query. It returns the current FCH configuration for the Messaging Teleservice including the forward and reverse Radio Configuration and the forward and reverse Multiplex option.	All

Subsystem BSSignal... (Signal of Base Station/CMU)

The subsystem *BSSignal* configures the RF, traffic channels, and levels of the signals transmitted by the CMU to the mobile station. It corresponds to the tab *BS Signal* in the popup menu *Connection Control*.

DEFault:BSSignal[?] ***<Enable>***				Default Settings
Enable	Description of parameters	Def. value	Def. unit	FW vers.
ON | OFF	The parameters are set to their default values The parameters differ from their default values (partially or totally)	ON	–	V3.05
Description of command				Sig. State
If used as a setting command with the parameter *ON*, this command sets all parameters of the subsystem BS Signal to their default values (the setting OFF results in an error message). If used as a query, the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.				SON SOFF REG Q: all

UNIT:BSSignal:CHANnel[:RF][?] ***<RF Channel Unit>***				RF Channel
<RF Channel Unit>	Description of parameters	Def. value	Def. unit	FW vers.
CH | HZ | MHZ | KHZ | GHZ	Frequency unit or Channel Number	CH	CH	V3.05
Description of command				Sig. State
This command defines whether the frequency of the RF signal generated is specified in frequency units or as an CDMA channel number. Frequency units must be used to select input signals that are outside the designated CDMA channel range.				SON SOFF REG Q: all

CONFigure:BSSignal:CHANnel[:RF][?]
PROCedure:BSSignal:CHANnel[:RF][?]
<RF Channel/Freq>

RF Channel

<RF Channel/Freq>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 300 .... 539 to 871 .... 1039 to 1473 .... 1792 to 2016	RF channels, Band Class 5, NTM-450	25		V3.05
1 to 799 .... 991 to 1023	RF channels, Band Class 0, US and Korean Cellular	283	–	
0 to 1000 .... 1329 to 2047	RF channels, Band Class 2, TACS	79		
1 to 799 .... 801 to 1039 .... 1041 to 1199 .... 1201 to 1600	RF channels, Band Class 3, JTACS	76	–	
0 to 359	RF channels, Band Class 7, North American 700 MHz	14		
0 to 699	RF channels, Band Class 9, 900 MHz	18		
0 to 919	RF channels, Band Class 10, Secondary 800 MHz	50		
0 to 1199	RF channels, Band Class 1, North American PCS	150	–	
0 to 599	RF channels, Band Class 4, Korean PCS	45	–	
0 to 1499	RF channels, Band Class 8, 1800 MHz PCS	16		
0 to 1199	RF channels, Band Class 6, IMT-2000	12		

Description of command	Sig. State
This command determines the RF channel number. The frequency changes according to the selected channel number. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.	See Descript.

CONFigure:BSSignal:POWer:CDMA[?]
PROCedure:BSSignal:POWer:CDMA[?]
<CDMA Power>

CDMA Power

<CDMA Power>	Description of parameters	Def. value	Def. unit	FW vers.
–120.0 dBm to –33.0 dBm | –120.0 dBm to –16.0 dBm | –100.0 dBm to 7.0 dBm | MINimum | MAXimum | DEFault	RF1 OUT , 0 dB ext. atten | RF2 OUT , 0 dB ext. atten | RF3 OUT , 0 dB ext. atten Sets the value to the range minimum Sets the value to the range maximum Sets the value to the default setting	–70.0	dBm	V3.05

Description of command	Sig. State
This command determines total CDMA output power (absolute value, in dBm). CDMA Power value range depends on the RF input used and the external attenuation set. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.	See Descript.

CONFigure:BSSignal:POWer:OUTPut?				Output Power
Returned Value	Description of parameters	Def. value	Def. unit	FW vers.
Output Power	–120.0 dBm to –33.0 dBm	NAN	dBm	V3.05

Description of command	Sig. State
This command is always a query. It returns the total output power of the CMU, i.e. the CDMA power plus the AWGN level.	SOFF SON REG Q: all

CONFigure:BSSignal:LEVel:FSYNc[?] **<FSYNC Level>**				RF Level
<FSYNC Level>	Description of parameters	Def. value	Def. unit	FW vers.
–20.0 dB to –7.0 dB |	Forward Sync Channel Level	–16.0	dB	V3.05
DEFault |	Sets the value to the default setting			
MINimum |	Sets the value to the range minimum			
MAXimum |	Sets the value to the range maximum			
ON |	Forward Sync Channel on			
OFF	Forward Sync Channel off			

Description of command	Sig. State
This command determines the signal level of the sync channel in the forward CDMA channel. The power is in units relative to the total CDMA power.	SOFF SON REG Q: all

CONFigure:BSSignal:LEVel:FPICh[?] ***<FPICH Level>***				RF Level
<FPICH Level>	Description of parameters	Def. value	Def. unit	FW vers.
–20.0 dB to –7.0 dB |	Forward pilot channel level	–7.0	dB	V3.05
DEFault |	Sets the value to the default setting			
MINimum |	Sets the value to the range minimum			
MAXimum |	Sets the value to the range maximum			
ON |	Forward pilot channel on			
OFF	Forward pilot channel off			

Description of command	Sig. State
This command determines the signal level of the pilot channel in the forward CDMA channel.	SOFF SON REG Q: all

CONFigure:BSSignal:LEVel:OCNS:ENABle[?] ***<Mode>***				OCNS Settings
<Mode> (for setting command)	Description of parameters	Def. value	Def. unit	FW vers.
ON | OFF	OCNS generator on or off	ON	–	V3.05

Description of command	Sig. State
This command switches the Orthogonal Channel Noise Simulator on or off. When set to ON, the OCNS level is such that the sum of all generator levels and the OCNS level equals the nominal base station power.	SOFF SON REG Q: all

CONFigure:BSSignal:LEVel:OCNS:VALue?				OCNS Settings
Returned Value	Description of parameters	Def. value	Def. unit	FW vers.
OCNS Level	OCNS level relative to CDMA power	–	dB	V3.05
Description of command				Sig. State
This command is always a query. It returns the level of the Orthogonal Channel Noise Simulator in units relative to the CDMA power (see `CONFigure:BSSignal:LEVel` command).				SOFF SON REG Q: all

CONFigure:BSSignal:PCBits[?] ***<Power Control Bits>***				Power Control Bits
<Power Control Bits>	Description of parameters	Def. value	Def. unit	FW vers.
OFF | AUTO | HOLD | ADOW | AUP | RTES | PATTern	Disable power control bits Auto mode, closed-loop operation Alternating up/down control bits All power control bits down All power control bits up Range test mode Pattern defined by means of the `CONF:BSS:PCB:PATTern...` commands	AUTO	–	V3.05
Description of command				Sig. State
This command defines the power control bits in the BS signal.				SOFF SON REG Q: all

CONFigure:BSSignal:PCBits:PATTern:SQMode[?] ***<Seq_Mode>***				Pattern Sequence Mode
<Seq_Mode>	Description of parameters	Def. value	Def. unit	FW vers.
PREP | PFBA | PFBH	Pattern repeated Pattern Followed by Auto Pattern Followed by Hold	PREP	–	V3.20
Description of command				Sig. State
This command selects the algorithm to construct the complete user-defined pattern from the single bit pattern defined by means of the `CONFigure:BSSignal:PCBits:PATTern:AREA<nr>`... commands.				SOFF SON REG Q: all

CONFigure:BSSignal:PCBits:SSIZe[?] ***<Step>***				Step Size
<Step>	Description of parameters	Def. value	Def. unit	FW vers.
0.25 dB | 0.5 dB | 1.0 dB	Power step size	1.0	dB	V3.40
Description of command				Sig. State
This command selects the step size that the mobile station is to use for closed loop power control. ***Note:*** *Changing the protocol revision of the CMU (`CONFigure:NETWork:SYSTem:PREVision`) resets the step size to its default value of 1.00 dB.*				SOFF SON REG Q: all

CONFigure:BSSignal:PCBits:PATTern:AREA<no>:NOBits[?] Number of Bits
<Number_of_Bits>

<Number_of_Bits>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 64 | 1 to 128	Number of bits for area no. 1 Number of bits for area no. 2, 3, 4	32 100	–	V3.20

Description of command	Sig. State
This command defines the number of bits in each of the 4 areas of the user-defined single pattern.	SOFF SON REG Q: all

CONFigure:BSSignal:PCBits:PATTern:AREA1:LHBit[?] Last Hold Bit
<Polarity>

<Polarity>	Description of parameters	Def. value	Def. unit	FW vers.
UP | DOWN	Last Hold Bit	DOWN	–	V3.20

Description of command	Sig. State
This command defines the bit polarity in area no. 1 of the user-defined single pattern.	SOFF SON REG Q: all

CONFigure:BSSignal:PCBits:PATTern:AREA<no>:POLarity[?] Polarity
<Polarity>

<Polarity>	Description of parameters	Def. value	Def. unit	FW vers.
UP | DOWN	Polarity	UP (area no. 2, 4) DOWN (area no. 3)	–	V3.20

Description of command	Sig. State
This command defines the bit polarity in areas 2 to 4 of the user-defined single pattern.	SOFF SON REG Q: all

CONFigure:BSSignal:CHANnel:FFCH[?] Traffic Channel
PROCedure:BSSignal:CHANnel:FFCH[?]
<FFCH Channel>

<FFCH Channel>	Description of parameters	Def. value	Def. unit	FW vers.
0 to 63	Forward fundamental traffic channel	8	–	V3.05

Description of command	Sig. State
This command determines the forward fundamental traffic channel number. The command is valid in the Call Established state. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.	See Descript.

CONFigure:BSSignal:LEVel:FFCH[?]
PROCedure:BSSignal:LEVel:FFCH[?]
<FFCH Level>

RF Level

<FFCH Level>	Description of parameters	Def. value	Def. unit	FW vers.
–20.0 dB to –7.0 dB |	Forward fundamental traffic channel level	–14.0	dB	V3.05
DEFault |	Sets the value to the default setting			
MINimum |	Sets the value to the range minimum			
MAXimum |	Sets the value to the range maximum			
ON |	Forward fundamental traffic channel level on			
OFF	Forward fundamental traffic channel level off			

Description of command	Sig. State
This command determines the signal level of the fundamental traffic channel in the forward CDMA channel. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.	See Descript.

CONFigure:BSSignal:FROFfset:FFCH[?]
PROCedure:BSSignal:FROFfset:FFCH[?]
<Frame Offs>

Frame Offset

<Frame Offs>	Description of parameters	Def. value	Def. unit	FW vers.
0 to +15	Frame offset	0	–	V3.05

Description of command	Sig. State
This command determines an offset for the traffic channel timing in CDMA frames. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.	See Descript.

CONFigure:BSSignal:QOF:FFCH[?]
PROCedure:BSSignal:QOF:FFCH[?]
<QOF>

QOF

<QOF>	Description of parameters	Def. value	Def. unit	FW vers.
0 to 3	Quasi-orthogonal Function	0	–	V3.05

Description of command	Sig. State
This command sets the Quasi-orthogonal Function that the Fundamental Channel uses in the forward CDMA channel. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.	See Descript.

CALCulate[:SCALar]:BSSignal:EBNT:FFCH?
<Eb/Nt>

F-FCH Eb/Nt

<Eb/Nt>	Description of parameters	Def. value	Def. unit	FW vers.
–30.969 dB to 18.072 dB	Calculated F-FCH Eb/Nt	–	dB	V3.10

Description of command	Sig. State
This command is always a query. It returns the calculated signal to noise ratio for the forward FCH. This quantity is undefined unless the AWGN generator is turned on (`CONFigure:IMPairments:LEVel:AWGN`). The quoted range of values is valid for data rates between 9.6 kbps and 153.6 kbps; see *Eb/Nt Calculation* in Chapter 4.	All

CONFigure:BSSignal:LEVel:FSCH:ZERO[?] SCH0 Level
PROCedure:BSSignal:LEVel:FSCH:ZERO[?]
<FSCH0 Level>

<FSCH0 Level>	Description of parameters	Def. value	Def. unit	FW vers.
–20.0 dB to –7.0 dB |	Forward supplemental traffic channel level	–14	dB	V3.05
DEFault |	Sets the value to the default setting			
MINimum |	Sets the value to the range minimum			
MAXimum |	Sets the value to the range maximum			
ON |	Forward supplemental traffic channel level on			
OFF	Forward supplemental traffic channel level off			

Description of command	Sig. State
This command determines the signal level of the supplemental traffic channel SCH0 in the forward CDMA channel. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.	See Descript.

CONFigure:BSSignal:CHANnel:FSCH:ZERO[?] SCH0 Channel
PROCedure:BSSignal:CHANnel:FSCH:ZERO[?]
<FSCH Channel>

<FSCH Channel>	Description of parameters	Def. value	Def. unit	FW vers.
0 to 63	Forward supplemental traffic channel SCH0	35	–	V3.05

Description of command	Sig. State
This command determines the forward supplemental traffic channel number. The command is valid in the Call Established state. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.	See Descript.

CONFigure:BSSignal:FROFfset:FSCH:ZERO[?] SCH0 Frame Offset
PROCedure:BSSignal:FROFfset:FSCH:ZERO[?]
<Frame Offs>

<Frame Offs>	Description of parameters	Def. value	Def. unit	FW vers.
0 to +15	SCH0 Frame offset	0	–	V3.05

Description of command	Sig. State
This command determines an offset for the forward supplemental traffic channel SCH0 timing in CDMA frames. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.	See Descript.

CONFigure:BSSignal:QOF:FSCH:ZERO[?] SCH0 QOF
PROCedure:BSSignal:QOF:FSCH:ZERO[?]
<QOF>

<QOF>	Description of parameters	Def. value	Def. unit	FW vers.
0 to 3	Quasi-orthogonal Function	0	–	V3.05

Description of command	Sig. State
This command sets the Quasi-orthogonal Function that the Supplemental Channel SCH0 uses in the forward CDMA channel. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.	See Descript.

CALCulate[:SCALar]:BSSignal:EBNT:FSCH:ZERO? F-SCH0 Eb/Nt
<Eb/Nt>

<Eb/Nt>	Description of parameters	Def. value	Def. unit	FW vers.
–30.969 dB to 18.072 dB	Calculated F-SCH0 Eb/Nt	–	dB	V3.10

Description of command	Sig. State
This command is always a query. It returns the calculated signal to noise ratio for the forward SCH0. This quantity is undefined unless the AWGN generator is turned on (`CONFigure:IMPairments:LEVel:AWGN`). The quoted range of values is valid for data rates between 9.6 kbps and 153.6 kbps; see *Eb/Nt Calculation* in Chapter 4.	All

CONFigure:BSSignal:LEVel:FSCH:ONE[?] SCH1 Level
PROCedure:BSSignal:LEVel:FSCH:ONE[?]
<FSCH1 Level>

<FSCH1 Level>	Description of parameters	Def. value	Def. unit	FW vers.
–20.0 dB to –7.0 dB |	Forward supplemental traffic channel level	–14	dB	V3.20
DEFault |	Sets the value to the default setting			
MINimum |	Sets the value to the range minimum			
MAXimum |	Sets the value to the range maximum			
ON |	Forward supplemental traffic channel level on			
OFF	Forward supplemental traffic channel level off			

Description of command	Sig. State
This command determines the signal level of the supplemental traffic channel SCH1 in the forward CDMA channel. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.	See Descript.

CONFigure:BSSignal:CHANnel:FSCH:ONE[?] SCH1 Channel
PROCedure:BSSignal:CHANnel:FSCH:ONE[?]
<FSCH Channel>

<FSCH Channel>	Description of parameters	Def. value	Def. unit	FW vers.
0 to 63	Forward supplemental traffic channel SCH1	37	–	V3.20

Description of command	Sig. State
This command determines the forward supplemental traffic channel number. The command is valid in the Call Established state. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.	See Descript.

CONFigure:BSSignal:FROFfset:FSCH:ONE[?] SCH1 Frame Offset
PROCedure:BSSignal:FROFfset:FSCH:ONE[?]
<Frame Offs>

<Frame Offs>	Description of parameters	Def. value	Def. unit	FW vers.
0 to +15	SCH1 Frame offset	0	–	V3.20

Description of command	Sig. State
This command determines an offset for the forward supplemental traffic channel SCH1 timing in CDMA frames. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.	See Descript.

CONFigure:BSSignal:QOF:FSCH:ONE[?]
PROCedure:BSSignal:QOF:FSCH:ONE[?]
<QOF>

SCH1 QOF

<QOF>	Description of parameters	Def. value	Def. unit	FW vers.
0 to 3	Quasi-orthogonal Function	0	–	V3.20

Description of command	Sig. State
This command sets the Quasi-orthogonal Function that the Supplemental Channel SCH1 uses in the forward CDMA channel. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.	See Descript.

CALCulate[:SCALar]:BSSignal:EBNT:FSCH:ONE?
<Eb/Nt>

F-SCH1 Eb/Nt

<Eb/Nt>	Description of parameters	Def. value	Def. unit	FW vers.
–30.969 dB to 18.072 dB	Calculated F-SCH1 Eb/Nt	–	dB	V3.20

Description of command	Sig. State
This command is always a query. It returns the calculated signal to noise ratio for the forward SCH1. This quantity is undefined unless the AWGN generator is turned on (`CONFigure:IMPairments:LEVel:AWGN`). The quoted range of values is valid for data rates between 9.6 kbps and 153.6 kbps; see *Eb/Nt Calculation* in Chapter 4.	All

CONFigure:BSSignal:CHANnel:FPCH[?]
PROCedure:BSSignal:CHANnel:FPCH[?]
<FPCH Channel>

Paging Channel

<FPCH Channel>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 7	Forward paging channel	1	–	V3.05

Description of command	Sig. State
This command determines the forward paging channel number. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.	See Descript.

CONFigure:BSSignal:LEVel:FPCH[?]
PROCedure:BSSignal:LEVel:FPCH[?]
<FPCH Level>

RF Level

<FPCH Level>	Description of parameters	Def. value	Def. unit	FW vers.
–20.0 dB to –7.0 dB |	Forward paging channel level	–7.0	dB	V3.05
DEFault |	Sets the value to the default setting			
MINimum |	Sets the value to the range minimum			
MAXimum |	Sets the value to the range maximum			
ON |	Forward paging channel level on			
OFF	Forward paging channel level off			

Description of command	Sig. State
This command determines the signal level of the paging channel in the forward CDMA channel. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.	See Descript.

CONFigure:BSSignal:USAGe:FQPCh[?]
PROCedure:BSSignal:USAGe:FQPCh[?]
<Quick Paging Channel>

Quick Paging Channel

<Quick Paging Channel>	Description of parameters	Def. value	Def. unit	FW vers.
ON | OFF	Forward quick paging channel	OFF	–	V3.05

Description of command	Sig. State
This command enables or disables the forward quick paging channel number. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.	See Descript.

CONFigure:BSSignal:CHANnel:FQPCh?
PROCedure:BSSignal:CHANnel:FQPCh?
<Quick Paging Channel>

Quick Paging Channel

<Quick Paging Channel>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 7	Forward quick paging channel	1	–	V3.05

Description of command	Sig. State
This command determines the forward quick paging channel number.	See Descript.

CONFigure:BSSignal:LEVel:FQPCh[?]
PROCedure:BSSignal:LEVel:FQPCh[?]
<Quick Paging Level>

Quick Paging Level

<Quick Paging Level>	Description of parameters	Def. value	Def. unit	FW vers.
–5.0 dB to 2.0 dB |	Forward quick paging channel level	–1.0	dB	V3.05
DEFault |	Sets the value to the default setting			
MINimum |	Sets the value to the range minimum			
MAXimum |	Sets the value to the range maximum			
ON |	Forward quick paging channel level on			
OFF	Forward quick paging channel level off			

Description of command	Sig. State
This command determines the signal level of the quick paging channel in the forward CDMA channel. The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.	See Descript.

CONFigure:BSSignal:IBITs:FQPCh[?]
PROCedure:BSSignal:IBITs:FQPCh[?]
<Indicator Bits>

Indicator Bits

<Indicator Bits>	Description of parameters	Def. value	Def. unit	FW vers.
00 to11	Quick paging channel instruction bits	11	–	V3.05

Description of command — Sig. State: See Descript.

This command sends the quick paging channel indicator bits to the mobile station to instruct the mobile to monitor the assigned pagin channel slot or go to sleep mode. Two bits are sent to increase reliability.

The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.

The bits are read as follows:

Read bit 1	Bit 1 = 1: Bit 1 = 0:	Read bit 2 Mobile to sleep mode
Read bit 2	Bit 2 = 1: Bit 2 = 0:	Mobile monitors paging channel Mobile to sleep mode

CONFigure:BSSignal:DUTPaging:FQPCh[?]
PROCedure:BSSignal:DUTPaging:FQPCh[?]
<DUT Paging>

Paging

<DUT Paging>	Description of parameters	Def. value	Def. unit	FW vers.
ON | OFF	Mobile station quick paging enable	ON	–	V3.05

Description of command — Sig. State: See Descript.

This command enables or disables the quick paging channel of the mobile station under test.

The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.

CONFigure:BSSignal:PROPerty:PNOFfset[?]
PROCedure:BSSignal:PROPerty:PNOFfset[?]
<PN Offs>

PN Offset

<PN Offs>	Description of parameters	Def. value	Def. unit	FW vers.
0 to +511	PN offset	0	–	V3.05

Description of command — Sig. State: See Descript.

This command determines an offset for the timing of the pilot channel, the sync channel message, and the long code mask of the paging channel.

The CONFigure form of the command is used in all signalling states except CEST. The PROCedure form of the command is used in the CEST signalling state.

CONFigure:BSSignal:PROPerty:CLDTime[?] Call Loss Timer
<Call Loss Timer>

<Call Loss Timer>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 5 |	Call loss detection timer	1	s	V3.05
DEFault |	Sets the value to the default setting			
MINimum |	Sets the value to the range minimum			
MAXimum |	Sets the value to the range maximum			
OFF |	Disables the call loss detection timer			
ON	Re-enables the call loss detection timer			

Description of command	Sig. State
This command sets the timeout value of the fade timer (in units of 0.1 seconds) to detect when a call is lost or dropped.	SOFF SON REG Q: all

Subsystem IMPairments... (Impairments to the BS Signal)

The subsystem *IMPairments* distorts the BS Signal in order to more closely simulate actual operating conditions. It corresponds to the *Impairments* section in the *BS Signal* tab in the popup menu *Connection Control*.

CONFigure:IMPairments:LEVel:AWGN[?] AWGN Level
<AWGN Level>

<AWGN Level>	Description of parameters	Def. value	Def. unit	FW vers.
–20.0 dB to +4.0 dB |	AWGN level	OFF	dB	V3.05
DEFault |	Sets the value to the default setting			
MINimum |	Sets the value to the range minimum			
MAXimum |	Sets the value to the range maximum			
ON |	AWGN generator on			
OFF	AWGN generator off			

Description of command	Sig. State
This command determines the Additive White Gaussian Noise level to impair the RF generator signal.	SOFF SON REG Q: all

CONFigure:IMPairments:FOFFset[:RF][?] Carrier Frequency Offset
<Freq. Offset>

<Freq. Offset>	Description of parameters	Def. value	Def. unit	FW vers.
–3.0 kHz to +3.0 kHz |	BS frequency offset setting	OFF	Hz	V3.05
DEFault |	Sets the value to the default setting			
MINimum |	Sets the value to the range minimum			
MAXimum |	Sets the value to the range maximum			
ON |	Frequency offset on			
OFF	No frequency offset			

Description of command	Sig. State
This command determines a frequency offset to impair the RF generator signal.	SOFF SON REG Q: all

CONFigure: IMPairments:ITFer[?] ***<FER>***				Injected Tx FER
<FER>	Description of parameters	Def. value	Def. unit	FW vers.
0% to 50% | OFF | ON	Injected Tx FER Switch FER injection off (equiv. to 0%) Re-activate FER injection, using the previously defined value	OFF	–	V3.20
Description of command				Sig. State
This command defines a percentage of faulty (i.e. erasure) frames that the CMU injects into all traffic channels of its BS Signal.				SOFF SON REG Q: all

Subsystem HANDoff:TARGet (Handoff Target)

The subsystem *HANDoff:TARGet* sets the target for a forced handoff of the mobile phone. The corresponding softkeys are located in the tab *Handoff* in the popup menu *Connect. Control*.

STATus:HANDoff:TARGet:LIST?				Destination List
Returns	Description of parameters	Def. value	Def. unit	FW vers.
"CDMA2KCellMS" | "CDMA2KPCSMS" | "CDMA2KIMT2KMS" | "CDMA2K450MS" | "AMPSMS" | "CDMA2KCellMSFallback" | "CDMA2KPCSMSFallback" | "CDMA2KIMT2KMSFallback" | "CDMA2K450MSFallback" | "AMPSMSFallback"	Target list for CDMA (excluding the origin network)	Complete list	–	V3.05
Description of command				Sig. State
This command is always a query and returns a list of all networks that are available for a handoff. On registration, the complete (default) target list is replaced by the actual target list depending on the capabilities of the mobile station.				All

CONFigure:HANDoff:TARGet[?] ***<Handoff Target>***				Destination Selection
<Handoff Target>	Description of parameters	Def. value	Def. unit	FW vers.
"CDMA2KCellMS" | "CDMA2KPCSMS" | "CDMA2KIMT2KMS" | "CDMA2K450MS" | "AMPSMS" | "CDMA2KCellMSFallback" | "CDMA2KPCSMSFallback" | "CDMA2KIMT2KMSFallback" | "CDMA2K450MSFallback" | "AMPSMSFallback"	Target for CDMA handoff	NONE	–	V3.05
NONE	No handoff			
Description of command				Sig. State
This command selects a handoff target. The targets available depend on the current network and on the capabilities of the mobile station; see previous command. The query returns `NONE` unless a destination has been selected before. Handoff is initiated via the `PROCedure:SIGNalling:ACTion HANDoff` command.				CEST Q: all

Subsystem NETWork

The subsystem *NETWork* determines parameters of the radio network and the existing radio link. The subsystem corresponds to the *Network* tab of the popup menu *Connection Control*.

Subsystem NETWork:IDENtity

The subsystem *NETWork:IDENtity* determines the identity of the radio network and the mobile. The subsystem corresponds to the table field *Network Identity* in the *Network* tab of the popup menu *Connection Control*.

CONFigure:NETWork:IDENtity:NID[?] ***<Network ID Number>***				Network ID
<Network ID Number>	Description of parameters	Def. value	Def. unit	FW vers.
0 to 65535 | MINimum | MAXimum | DEFault	Network identity code Sets the value to the range minimum Sets the value to the range maximum Sets the value to the default setting	“1”	–	V3.05
Description of command				Sig. State
This command defines the 16-bit network identity code.				SOFF SON REG Q: all

CONFigure:NETWork:IDENtity:MCC[?] Mobile Country Code
<Mobile Country Code_Network>

<Mobile Country Code_Network>	Description of parameters	Def. value	Def. unit	FW vers.
0 to 999 |	Mobile country code	"999"	–	V3.05
DEFault	Sets the value to the default setting			

Description of command	Sig. State
This command defines the mobile country code for the network.	SOFF SON REG Q: all

Subsystem MSSignal (Mobile Settings)

The subsystem *MSSignal* defines mobile parameters used to set up the connection. The subsystem corresponds to the table field *Mobile Settings* in the *Network* tab of the popup menu in *Connection Control*.

CONFigure:MSSignal:ID[?] MS ID Type
<Mobile ID (MIN/IMSI>

<Mobile ID (MIN/IMSI>	Description of parameters	Def. value	Def. unit	FW vers.
{Value} |	34-bit MIN (mobile identification number) or 50-bit IMSI (international mobile subscriber identity)	0000000001	–	V3.05
DEFault	Sets the value to the default setting			

Description of command	Sig. State
This command determines which type of mobile station identity is to be used for call setup to the mobile phone.	All

CONFigure:MSSignal:ID:URData[?] Use Mobile Registration Data
<Mobile ID (MIN/IMSI>

<Mobile ID (MIN/IMSI>	Description of parameters	Def. value	Def. unit	FW vers.
ON |	Use mobile registration data to attempt a connection	OFF	–	V3.05
OFF |	Always use fixed mobile ID			
DEFault	Sets the value to the default setting			

Description of command	Sig. State
This command qualifies whether the CMU uses the mobile ID received during mobile registration or the ID defined via `CONFigure:MSSignal:ID` to attempt a connection.	All

CONFigure:MSSignal:MCC[?] MS Country Code
<Mobile Country Code>

<Mobile Country Code>	Description of parameters	Def. value	Def. unit	FW vers.
0 to 999 |	Mobile country code	999	–	V3.05
DEFault	Sets the value to the default setting			

Description of command	Sig. State
This command defines the mobile station's country code.	All

Subsystem NETWork:SYSTem (System Parameters)

The subsystem *NETWork:System* determines system parameters for the radio connection. The subsystem corresponds to the table field *System Parameters* in the *Network* tab of the popup menu in *Connection Control*.

CONFigure:NETWork:SYSTem:SID[?] Network System ID
<System ID Number>

<System ID Number>	Description of parameters	Def. value	Def. unit	FW vers.
0 to 32767 | MINimum | MAXimum | DEFault	System ID number Sets the value to the range minimum Sets the value to the range maximum Sets the value to the default setting	1	–	V3.05

Description of command	Sig. State
This command defines the network system identification for the CMU.	SOFF SON REG Q: all

CONFigure:NETWork:SYSTem:BSID[?] Base Station ID
<Base Station ID Number>

<Base Station ID Number>	Description of parameters	Def. value	Def. unit	FW vers.
0 to 65535 | MINimum | MAXimum | DEFault	16-bit BTS ID Sets the value to the range minimum Sets the value to the range maximum Sets the value to the default setting	1	–	V3.05

Description of command	Sig. State
This command defines the base station identification for the CMU.	SOFF SON REG Q: all

CONFigure:NETWork:SYSTem:PREVision[?] Protocol Revision
<Protocol Revision>

<Protocol Revision>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 6 MINimum | MAXimum | DEFault	Protocol Revision Sets the value to the range minimum Sets the value to the range maximum Sets the value to the default setting	6	–	V3.05

Description of command	Sig. State
This command defines the version of the transmission protocol for the CMU to use. **Note:** *Changing the Protocol Revision of the CMU resets the Power Control Step Size* `CONFigure:BSSignal:PCBits:SSIZe` *to its default value of 1.00 dB.*	SOFF SON REG Q: all

CONFigure:NETWork:SYSTem:MPRevision[?] Minimum Protocol Revision
<Minimum Protocol Revision>

<Minimum Protocol Revision>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 6 | MINimum | MAXimum | DEFault	Minimum protocol revision Sets the value to the range minimum Sets the value to the range maximum Sets the value to the default setting	1	–	V3.05

Description of command	Sig. State
This command defines the minimum protocol revision capability of the mobile station.	SOFF SON REG Q: all

CONFigure:NETWork:SYSTem:IMSI:ETWelve[?] BS IMSI
<IMSI 11 12>

<IMSI 11 12>	Description of parameters	Def. value	Def. unit	FW vers.
00 to 99 | DEFault	ASCII value Sets the value to the default setting	01	–	V3.05

Description of command	Sig. State
This command defines an ASCII string containing two digits representing the 11th and 12th digit of the IMSI of the base station.	SOFF SON REG Q: all

CONFigure:NETWork:SYSTem:UWCard[?] State Use Wildcard
<State Use Wildcard>

<State Use Wildcard>	Description of parameters	Def. value	Def. unit	FW vers.
ON | OFF	Special values for MCC and IMSI_11_12 on or off.	OFF	–	V3.05

Description of command	Sig. State
This value indicates whether to use special values for MCC and IMSI_11_12 that indicate to the mobile that it needs to use only IMSI_S.	SOFF SON REG Q: all

CONFigure:NETWork:SYSTem:AUTHentic[?] State Authentication
<State Authentication>

<State Authentication>	Description of parameters	Def. value	Def. unit	FW vers.
ON | OFF	Authentication mode	OFF	–	V3.05

Description of command	Sig. State
This command switches the authentication mode on and off.	SOFF SON REG Q: all

CONFigure:NETWork:SYSTem:ACHallenge[?] ***<State Challenge>***				State Challenge
<State Challenge>	Description of parameters	Def. value	Def. unit	FW vers.
00000000_{HEX} to $FFFFFFFF_{HEX}$	8 digit hex string	DEAFBEEF	–	V3.05
Description of command				Sig. State
This command sets the random challenge value for authentication. It is valid only with Authentication mode is switched on.				SOFF SON REG Q: all

Subsystem NETWork:PCHannel (Paging Channel)

The subsystem *NETWork:PCHannel* determines the paging channel parameters. The subsystem corresponds to the table field *Paging Channel* in the *Network* tab of the popup menu in *Connection Control*.

CONFigure:NETWork:PCHannel:RATE ***<Paging Channel Rate>***				Paging Channel Rate
<Paging Channel Rate>	Description of parameters	Def. value	Def. unit	FW vers.
R4K8 | R9K6 | DEFault	4800 bps data rate 9600 bps data rate Sets the value to the default setting	R9K6	Bps	V3.05
Description of command				Sig. State
This command sets the date rate of the paging channel.				SOFF SON REG Q: all

CONFigure:NETWork:PCHannel:SCINdex[?] ***<Paging CH Slot Cycle Index>***				Slot Cycle Index
<Paging CH Slot Cycle Index>	Description of parameters	Def. value	Def. unit	FW vers.
0 to 7 | MINimum | MAXimum | DEFault	10-bit Slot Cycle index Sets the value to the range minimum Sets the value to the range maximum Sets the value to the default setting	0	–	V3.05
Description of command				Sig. State
This command determines the length of the slot cycle by setting the number of slots in the slot cycle. Each slot cycle equals 1.28 seconds. The number of slots in the slot cycle is determined by the formula: Slot cycle = 1.28×2^i (where i equals the slot cycle index) For example: i = 0 Slot cycle = 1.28 seconds i = 1 Slot cycle = 2.56 seconds i = 2 Slot cycle = 5.12 seconds The paging channel is monitored during the slot cycle when operating in the slotted mode. A mobile stations slot occurs once per slot cycle				SOFF SON REG Q: all

CONFigure:NETWork:PCHannel:MSCindex[?] Max. Slot Cycle Index
<Max Slot Cycle Index>

<Max Slot Cycle Index>	Description of parameters	Def. value	Def. unit	FW vers.
0 to 7 |	Maximum 10-bit slot cycle index	0	–	V3.05
MINimum |	Sets the value to the range minimum			
MAXimum |	Sets the value to the range maximum			
DEFault	Sets the value to the default setting			

Description of command	Sig. State
This command sets the maximum slot cycle index allowed to determine the slot cycle length.	SOFF SON REG Q: all

Subsystem NETWork:REGistration

The subsystem *NETWork:REGistration* defines when the registration procedure is to be performed. The subsystem corresponds to the table field *Registration* in the *Network* tab of the popup menu in *Connection Control*.

CONFigure:NETWork:REGistration:TBASed[?] Timer Based Registration
<Timer Based Registration>

<Timer Base Registration>	Description of parameters	Def. value	Def. unit	FW vers.
R012sec | R014sec | R017sec | R020sec | R024sec | R029sec | R034sec | R041sec | R049sec | R058sec | R069sec | R082sec | R089sec | R097sec | R116sec | DEF |	Registration interval in seconds	R012sec	–	V3.05
OFF	No periodic registration			

Description of command	Sig. State
This command sets the time between registration attempts.	SOFF SON REG Q: all

CONFigure:NETWork:REGistration:HOME[?] Registration Home
<Registration Home>

<Registration Home>	Description of parameters	Def. value	Def. unit	FW vers.
ON | OFF	Home registration on or off	ON	–	V3.05

Description of command	Sig. State
This command enables the home (non-roaming) registration mode.	SOFF SON REG Q: all

CONFigure:NETWork:REGistration:FSID[?] ***<Registration SID>***				Registration FSID
<Registration SID>	Description of parameters	Def. value	Def. unit	FW vers.
ON | OFF	Foreign System ID registration on or off	ON	–	V3.05
Description of command				Sig. State
This command determines whether a registration procedure is to be executed when the system identity is changed.				SOFF SON REG Q: all

CONFigure:NETWork:REGistration:FNID[?] ***<Registration NID>***				Registration FNID
<Registration NID>	Description of parameters	Def. value	Def. unit	FW vers.
ON | OFF	Foreign Network ID registration on or off	ON	–	V3.05
Description of command				Sig. State
This command determines whether a registration procedure is to be executed when the network identity is changed.				SOFF SON REG Q: all

CONFigure:NETWork:REGistration:PUP[?] ***<Registration Up>***				Registration Power Up
<Registration Up>	Description of parameters	Def. value	Def. unit	FW vers.
ON | OFF	Power up registration on or off	ON	–	V3.05
Description of command				Sig. State
This command determines whether a registration procedure is to be executed on power-up of the mobile station.				SOFF SON REG Q: all

CONFigure:NETWork:REGistration:PDOWn[?] ***<Registration Down>***				Registration Power Down
<Registration Down>	Description of parameters	Def. value	Def. unit	FW vers.
ON | OFF	Registration at power down on or off	ON	–	V3.05
Description of command				Sig. State
This command determines whether a registration procedure is to be executed on power-down of the mobile station.				SOFF SON REG Q: all

CONFigure:NETWork:REGistration:PARameter[?] ***<Registration Reg>***				Registration Parameter
<Registration Reg>	Description of parameters	Def. value	Def. unit	FW vers.
ON | OFF	Parameter registration mode on of off	ON	–	V3.05
Description of command				Sig. State
This command determines whether a registration procedure is to be executed after a parameter change.				SOFF SON REG Q: all

Subsystem NETWork:APRobes

The subsystem *NETWork:APRobes* determines the access probe channel parameters. The subsystem corresponds to the table field *Access Probes* in the *Network* tab of the popup menu in *Connection Control*.

CONFigure:NETWork:APRobes:MODE[?] ***<Mode>***				Access Probes
<Mode>	Description of parameters	Def. value	Def. unit	FW vers.
ACKNowledge | IGNore | DEFault	Acknowlege or ignore access probes	ACKN		V3.05
Description of command				Sig. State
This command instructs the CMU to acknowledge or ignore the access probes form the mobile station.				SOFF SON REG Q: all

CONFigure:NETWork:APRobes:NOFFset[?] ***<Nominal Offset>***				Access Probes
<Nominal Offset>	Description of parameters	Def. value	Def. unit	FW vers.
–24/–8 dB to 7 dB | MINimum | MAXimum | DEFault	Nominal offset power	0 dB	dB	V3.05
Description of command				Sig. State
This command sets the nominal transmit power of the access probes. The offset range is dependent on the Network setting.				SOFF SON REG Q: all

CONFigure:NETWork:APRobes:IOFFset[?] ***<Initial Offset>***				Access Probes
<Initial Offset>	Description of parameters	Def. value	Def. unit	FW vers.
–16 dB to 15 dB | MINimum | MAXimum | DEFault	Initial power offset	0 dB	dB	V3.05
Description of command				Sig. State
This command sets the value of the initial transmit power offset of the access probes.				SOFF SON REG Q: all

CONFigure:NETWork:APRobes:PINCrement[?] ***<Power Increment>***				Access Probes
<Power Increment>	Description of parameters	Def. value	Def. unit	FW vers.
0 dB to 7 dB | MINimum | MAXimum | DEFault	Access probe power increment	3 dB	dB	V3.05
Description of command				Sig. State
This command sets the size of the power step between access probe sequences.				SOFF SON REG Q: all

CONFigure:NETWork:APRobes:PPSQuence[?] ***<Probes per Sequence>***				Access Probes
<Probes per Sequence>	Description of parameters	Def. value	Def. unit	FW vers.
0 to 16 | MINimum | MAXimum | DEFault	Access probes contained in sequence	16	–	V3.05
Description of command				Sig. State
This command sets the number of access probes contained within the access probe sequence.				SOFF SON REG Q: all

CONFigure:NETWork:APRobes:SPATtempt[?] ***<Probe Sequences>***				Access Probes
<Probe Sequences>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 15 | MINimum | MAXimum | DEFault	Number of access probe sequences	1	–	V3.05
Description of command				Sig. State
This command sets the number of access probe sequences sent during the access attempt.				SOFF SON REG Q: all

SAPPower (Standby and Access Probe Power)

The subsystem *SAPPower* contains the commands for measuring the standby and access probe power. It corresponds to the softkey *Power* of the tab *Signalling* in the menu group *Connect. Control.*

Note: *In contrast to the measurement groups reported below, the* `SAPPower` *measurement can be performed in the signalling states SON, and REG only. Configurations are always possible.*

INITiate:SAPPower	Start new measurement	⇒ RUN
ABORt:SAPPower	Abort running measurement and switch off	⇒ *OFF*
STOP:SAPPower	Stop measurement after current stat. cycle	⇒ *STOP*
CONTinue:SAPPower	Next measurement step (*stepping mode*)	⇒ *RUN*

Description of command	Sig. State	FW vers.
These commands have no query form. They start or stop the measurement, setting it to the status given in the top right column.	SON REG	V3.00

CONFigure:SAPPower:EREPorting[?] Event Reporting
<Report Mode>

<Report Mode>	Description of parameters	Def. value	Def. unit	FW vers.
SRQ |	Service request	OFF	–	V3.00
SOPC |	Single operation complete			
SRSQ |	SRQ and SOPC			
OFF	No reporting			

Description of command	Sig. State
This command defines the events generated when the measurement is terminated or stopped *(event reporting,* see Chapter 5).	all

FETCh[:SCALar]:SAPPower:STATus?
<Measurement Status>*, *<Statistic Count>

<Measurement Status>	Description of parameters	Def. value	Def. unit	
OFF |	Measurement in the *OFF* state (`*RST` or `ABORt`)	OFF	–	
RUN |	Running (after `INITiate`, `CONTinue` or `READ`)			
STOP |	Stopped (`STOP`)			
ERR |	*OFF* (could not be started)			
STEP |	Stepping mode *(<stepmode>=STEP)*			
RDY	Stopped according to repetition mode and stop condition			

<Statistic Count>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 10000 |	Counter for current statistics cycle	OFF		V3.00
NONE	No counting mode set			

Description of command	Sig. State
This command is always a query. It returns the status of the measurement (see Chapters 3 and 5).	all

	Scalar Results:
READ[:SCALar]:SAPPower?	Start single shot measurement and return results
FETCh[:SCALar]:SAPPower?	Read out measurement results (unsynchronized)
SAMPle[:SCALar]:SAPPower?	Read out measurement results (synchronized)
<Standby Power>*, *<Access Probe Power>	

<Standby Power>	Description of parameters	Def. value	Def. unit	
–30.0 dBm to +30.0 dBm	Standby power	NAN	dBm	
<Access Probe Power>	Description of parameters	Def. value	Def. unit	FW vers.
–30.0 dBm to +30.0 dBm	Access probe power	NAN	dBm	V3.00
Description of command				Sig. State
These commands are always queries. They start the measurement of the standby and access probe power and output the result.				SON REG

AF and RF Input, Output, and External Attenuation

These subsystems contain the commands for configuration of the input and output RF connectors and the AF connectors. The subsystem corresponds to the tab AF/RF in the popup menu *Connect Control*.

INPut[:STATe] <*State*> RF Input

<State>	Description of parameters	Def. value	Def. unit	FW vers.
RF1 RF2 RF4	Connector RF1 used as input Connector RF2 used as input Connector RF4 IN used as input	RF2	–	V3.05
Description of command				Sig. State
This command determines the connector to be used for RF input signals. The bi-directional connectors RF 1 and RF 2 can be used both as input and output connectors in the same measurement (see OUTPut[:STATe]). Only one input and one output may be active at the same time, a new RF input setting supersedes the previous one.				All

OUTPut[:STATe] <*State*> RF Output

<State>	Description of parameters	Def. value	Def. unit	FW vers.
RF1 RF2 RF3	Connector RF1 used as output Connector RF2 used as output Connector RF3 OUT used as output	RF2	–	V3.05
Description of command				Sig. State
This command determines the connector to be used for RF output signals. The bi-directional connectors RF 1 and RF 2 can be used as input and output connectors in the same measurement (see `INPut[:STATe]`). Only one input and one output may be active at the same time, a new RF output setting supersedes the previous one.				All

[SENSe:]CORRection:LOSS:INPut<nr>[:MAGNitude] <*Attenuation*>
SOURce:CORRection:LOSS:INPut<nr>[:MAGNitude] <Attenuation>

Ext. Att. Input

<Attenuation>	Description of parameters	Def. value	Def. unit	FW vers.
–50 dB to +90 dB	Value for external attenuation at output <nr>, where <nr> = 1, 2, 4	0.0	dB	V3.05

Description of command	Sig. State
This command assigns an external attenuation value to the inputs of the instrument *(RF 1, RF 2, RF 4 IN)*.	All

[SENSe:]CORRection:LOSS:OUTPut<nr>[:MAGNitude]
SOURce:CORRection:LOSS:OUTPut<nr>[:MAGNitude]
<Attenuation>

Ext. Att. Output

<Attenuation>	Description of parameters	Def. value	Def. unit	FW vers.
–50 dB to +90 dB	Value for external attenuation at output <nr>, where <nr> = 1, 2, 3	0.0	dB	V3.05

Description of command	Sig. State
This command assigns an external attenuation value to the outputs of the instrument *(RF 1, RF 2, RF 3 OUT)*.	All

ROUTe:SPENcoder[:INPut][?]
<Encoder Input>

Speech Input

<Speech Encoder Input>	Description of parameters	Def. value	Def. unit	FW vers.
HANDset | GENerator	Use 9-pole SPEECH connector Use AF OUT connector	HAND	–	V3.05

Description of command	Sig. State
This command selects the input source for the CMU speech encoder. The GENerator setting uses the audio generator signal which is fed to the AF OUT connector.	All

ROUTe:SPDecoder[:OUTPut][?]
<Decoder Output>

Speech Output

<Speech Decoder Output>	Description of parameters	Def. value	Def. unit	FW vers.
HANDset | ANALyzer | ANA2 | ABOTh	Output to 9-pole SPEECH connector Output to audio analyzer. AF IN disabled. Output to secondary audio analyzer. AUX 1 disabled Output to primary audio analyzer. AF IN and AUX 1 disabled.	HAND	–	V3.05

Description of command	Sig. State
This command routes the speech decoder output to the selected destination.	All

Subsystem DM:CLOCk (Synchronization)

The subsystem *DM:CLOCk* sets a system clock specific to the network. This frequency is set in the tab *Sync.* in the popup menu *Connection Control*.

SOURce:DM:CLOCk:STATe ***<Mode>***				REF OUT 2
<Mode>	Description of parameters	Def. value	Def. unit	FW vers.
ON | OFF	Switch on/off system clock	OFF	–	V3.05
Description of command				Sig. State
This command switches the system clock at output *REF OUT 2* on or off.				All

SOURce:DM:CLOCk:FREQuency *<Frequency>* ***<Frequency>***				REF OUT 2
<Frequency>	Description of parameters	Def. value	Def. unit	FW vers.
39.3216 MHz | 19.6608 MHz | 13.1072 MHz | 9.8304 MHz	System Clock Frequency	39.3216	MHz	V3.03
Description of command				Sig. State
This command determines the system clock frequency applied to *REF OUT 2* .				All

Subsystem TRIGger (Trigger Mode)

The subsystem *TRIGger* defines the trigger source. It corresponds to the tab *Misc.* in the popup menu *Connection Control*.

DEFault:TRIGger[:SEQuence][?] Default All Settings
<Trigger Source>

<Trigger Source>	Description of parameters	Def. value	Def. unit	FW vers.
ON | OFF	The parameters are set to their default values Some or all parameters are not set to default	ON	–	V3.10

Description of command

If used as a setting command with the parameter *ON,* this command sets all parameters of the subsystem TRIGger to their default values (the setting OFF results in an error message).

If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF).*

TRIGger[:SEQuence]:SOURce[?] Trigger
<Trigger>

<Trigger>	Description of parameters	Def. value	Def. unit	FW vers.
INTernal |	Trigger source from internal clock	INT	–	V3.03
EXTernal |	External Trigger source supplied			
FRUN |	Trigger set to free run			V3.40
RFPower |	Wideband RF power trigger			
IFPower	Narrow-band IF power trigger			

Description of command	Sig. State
This command selects the source of the trigger event. *INTernal* uses the trigger signal from the signalling unit of the CMU. The settings *RFPower* and *IFPower* require burst signals. *External* requires a trigger source supplied via the AUX 3 connector on the front panel. **AUX 3 pin assignments** Output trigger signals: see command `TRIGger:OUTPut:PIN<nr>:SIGNal[?]` Input trigger: Pin 8: Trigger Input H-PSK measurements and the Transmit Time Error measurement require particular trigger settings and synchronization; see Chapter 4.	All

TRIGger[:SEQuence]:THReshold:RFPower *<Threshold>* Level – RF Power

<Threshold>	Parameter description	Def. value	Default unit	FW vers.
LOW |	Low trigger threshold *(RF Max. Level* – 26 dB)	MEDium	–	V3.40
MEDium |	Medium trigger threshold *(RF Max. Level* – 16 dB)			
HIGH	High trigger threshold *(RF Max. Level* – 6 dB)			

Command description	Sig. State
This command sets the RF input signal level at which the measurement is triggered relative to the maximum RF input level; see `[SENSe:]LEVel:MAXimum`. The setting has effect for trigger source `RFPower` only (see `TRIG:SEQ:SOUR:<Modulation>`).	All

TRIGger[:SEQuence]:THReshold:IFPower *<Threshold>* Level – IF Power

<Threshold>	Parameter description	Def. value	Default unit	FW vers.
–47 dB to 0 dB	IF power threshold	–16	dB	V3.40

Command description	Sig. State
This command sets the IF signal level at which the measurement is triggered. The IF power threshold is defined relative to the maximum RF input level; see `[SENSe:]LEVel:MAXimum`. The setting has effect for trigger source `IFPower` only (see `TRIG:SEQ:SOUR:<Modulation>`).	All

TRIGger[:SEQuence]:SLOPe *<Slope>* Slope

<Slope>	Parameter description	Def. value	Default unit	FW vers.
POSitive | **NEGative**	Rising edge Falling edge	POS	–	V3.40

Command description	Sig. State
This command qualifies whether the trigger event occurs on the *Rising Edge* or on the *Falling Edge* of the trigger signal. The setting has no influence on *Free Run* measurements (see `TRIG:SEQ:SOUR`).	All

TRIGger:OUTPut:PIN<nr>:SIGNal[?] Output Routing
<Frame_Period>

<Frame_Period>	Description of parameters	Def. value	Def. unit	FW vers.
NONE |	No output trigger signal	<nr> = 2: SNCF	–	V3.10
PP2S |	Periodic pulse with period 2 s	<nr> = 3 = PP2S		
SFRame |	Super frame, 80 ms	<nr> = 4 = SFR		
SNCFrame |	Sync. frame, 26.67 ms	<nr> = 5 = PFR		
PFRame |	Paging frame, 20 ms			
PCFRame |	Power control frame, 1.25 ms			
DEFault	Use default settings			

Description of command

This command selects the type of periodic pulse signal (or no signal, setting *NONE)* to be applied to pins 2, 3, 4,and 5 (<nr> = 2 to 5) of the AUX 3 connector.

Subsystem LEVel (Input Path Settings)

The subsystem *LEVel* configures the RF input path by defining the expected input level. It corresponds to the tab *Analyzer* in the popup menu *Connection Control.*

DEFault:RFANalyzer[?] RF Analyzer
<RF Analyzer>

<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | OFF	The parameters are set to their default values The parameters differ from the default values (partially or totally)	ON	–	V3.05

Description of command

If used as a setting command with the parameter *ON,* this command sets all parameters of the subsystems LEVel to their default values (the setting OFF results in an error message).

If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF).*

[SENSe:]LEVel:MODE[?] RF Level Mode
<RF Level Mode>

<RF Level Mode>	Description of parameters	Def. value	Def. unit	FW vers.
AUTomatic | MANual	Maximum input level mode for RF	MAN	–	V3.05

Description of command

This command defines the maximum expected input level mode.

[SENSe:]LEVel:MAXimum[?] ***<RF Manual Max Level>***				Max. RF Level
<RF Manual Max Level>	Description of parameters	Def. value	Def. unit	FW vers.
–43 dBm to +44 dBm –57 dBm to +30 dBm –80 dBm to +9 dBm	Maximum input level for RF 1 Maximum input level for RF 2 Maximum input level for RF 4 IN	0.0 0.0 0.0	dBm dBm dBm	V3.05
Description of command				
This command defines the maximum expected input level. The value range depends on the RF input used and the external attenuation set (see `[SENSe:]CORRection:LOSS:INPut<nr>[:MAGNitude]` command).				

Subsystem ENVironment (Measurement Environments)

The subsystem *ENVironment…* enables or disables all measurement environments. This parameter is set in the *Misc.* tab of the popup menu *Connection Control*.

CONFigure:ALL:ENVironment:ENABle[?] *<Enable>*				Environment Enable
<Enable>	Description of parameters	Def. Value	Def. Unit	FW vers.
ON | OFF | SOME	Enable or disable all measurement environments Some but not all measurement environments enabled (no setting parameter, returned by query only)	ON	–	V3.20
Description of command				Sig. State
This command enables or disables all measurement environments. SOME is returned if the measurement environments were enabled or disabled selectively using the `CONFigure:<Application>:ENVironment:ENABle` commands.				All

Subsystem MMONitor (Message Monitor)

DEFault:MMONitor[?] ***<Enable>***				Default Settings
Enable	Description of parameters	Def. value	Def. unit	FW vers.
ON | OFF	The parameters are set to their default values The parameters differ from their default values (partially or totally)	ON	–	V3.05
Description of command				Sig. State
If used as a setting command with the parameter *ON,* this command sets all parameters of the subsystem MMONitor to their default values (the setting OFF results in an error message). If used as a query, the command returns whether all parameters are set to their default values *(ON)* or not *(OFF).*				All

CONFigure:MMONitor:IPADdress[?] IP Address
<IP Address 1>, <IP Address 2>, <IP Address 3>, <IP Address 4>

<IP Address 1>	Description of parameters	Def. value	Def. unit	
0 to 255 | MINimum | MAXimum | DEFault,	First segment of IP address	192	–	
<IP Address 2>	Description of parameters	Def. value	Def. unit	
0 to 255 | MINimum | MAXimum | DEFault,	Second segment of IP address	168	–	
<IP Address 3>	Description of parameters	Def. value	Def. unit	
0 to 255 | MINimum | MAXimum | DEFault,	Third segment of IP address	0	–	
<IP Address 4>	Description of parameters	Def. value	Def. unit	FW vers.
0 to 255 | MINimum | MAXimum | DEFault	Forth segment of IP address	2	–	V3.03
Description of command				Sig. State
This command sets the IP address of the CMU.				All

CONFigure:MMONitor:SMASk[?] Subnet Mask
<Subnet Mask 1>, <Subnet Mask 2>, <Subnet Mask 3>, <Subnet Mask 4>

<Subnet Mask 1>	Description of parameters	Def. value	Def. unit	
0 to 255 | MINimum | MAXimum | DEFault,	First segment of Subnet Mask	255	–	
<Subnet Mask 2>	Description of parameters	Def. value	Def. unit	
0 to 255 | MINimum | MAXimum | DEFault,	Second segment of Subnet Mask	255	–	
<Subnet Mask 3>	Description of parameters	Def. value	Def. unit	
0 to 255 | MINimum | MAXimum | DEFault,	Third segment of Subnet Mask	255	–	
<Subnet Mask 4>	Description of parameters	Def. value	Def. unit	FW vers.
0 to 255 | MINimum | MAXimum | DEFault	Forth segment of Subnet Mask	0	–	V3.03
Description of command				Sig. State
This command sets the Subnet Mask of the CMU.				All

CONFigure:MMONitor:SGATeway[?] *<Gateway 1>, <Gateway 2>, <Gateway 3>, <Gateway 4>*				Gateway
<Gateway 1>	Description of parameters	Def. value	Def. unit	
0 to 255 | MINimum | MAXimum | DEFault,	First segment of Standard Gateway	192	–	
<Gateway 2>	Description of parameters	Def. value	Def. unit	
0 to 255 | MINimum | MAXimum | DEFault,	Second segment of Standard Gateway	168	–	
<Gateway 3>	Description of parameters	Def. value	Def. unit	
0 to 255 | MINimum | MAXimum | DEFault,	Third segment of Standard Gateway	0	–	
<Gateway 4>	Description of parameters	Def. value	Def. unit	FW vers.
0 to 255 | MINimum | MAXimum | DEFault	Forth segment of Standard Gateway	1	–	V3.03
Description of command				Sig. State
This command sets the Standard Gateway of the CMU.				All

OVERview Measurements

The subsystem *OVERview* measures the most important power, modulation, and receiver quality parameters using a set of configuration settings that is independent of the other measurement groups *(POWer, MODulation, Code Domain Power, RXQuality)*. The subsystem corresponds to the *Overview* menu and the associated popup menu *Overview Configuration.*

Subsystem OVERview:MCQuality

The subsystem *OVERview:MCQuality:ENVironment...* configures the generated RF signal. It corresponds to the *Measurement Environment* section in the *Control* tab of the *Overview Configuration* menu. The settings are used only if the environment is enabled; see `CONFigure:OVERview:MCQuality:ENVironment:ENABle`. All settings apply to both O-QPSK and H-PSK modulation.

CONFigure:OVERview:MCQuality:ENVironment:ENABle[?] ***<Enable>*** Environment Enable

<Enable>	Description of parameters	Def. Value	Def. Unit	FW vers.
ON | OFF	Enable or disable environment	ON	–	V3.20
Description of command				Sig. State
This command enables or disables the environment for all *Overview* measurement applications.				All

CONFigure:OVERview:MCQuality:ENVironment:POWer:CDMA[?] **<CDMA Power>** CDMA Power

<CDMA Power>	Description of parameters	Def. value	Def. unit	FW vers.
–120.0 dBm to –33.0 dBm | –120.0 dBm to –16.0 dBm | –100.0 dBm to +7.0 dBm | DEFault | MINimum | MAXimum	RF1 OUT, 0 dB ext. atten RF2 OUT, 0 dB ext. atten RF3 OUT, 0 dB ext. atten Sets the value to the default setting Sets the value to the range minimum Sets the value to the range maximum	–60.0	dBm	V3.20
Description of command				Sig. State
This command determines the total CDMA output power (absolute value, in dBm) of the CMU. The CDMA Power value range depends on the RF input used and the external attenuation set.				All

CONFigure:OVERview:MCQuality:ENVironment:LEVel:FPICh[?] ***<Pilot Level>*** F-PICH Level

<Pilot Level>	Description of parameters	Def. value	Def. unit	FW vers.
–20.0 dB to –7.0 dB | OFF	Pilot Level F-PICH switched off	–7.0	dB	V3.20
Description of command				Sig. State
This command determines the level in the forward pilot channel of the CMU. The channel power is in units relative to the total CDMA power.				All

CONFigure:OVERview:MCQuality:ENVironment:LEVel:FFCH[?] F-FCH Level
<FCH Level>

<FCH Level>	Description of parameters	Def. value	Def. unit	FW vers.
–20.0 dB to –7.0 dB | OFF	FCH Level F-FCH switched off	–7.4	dB	V3.20

Description of command	Sig. State
This command determines the level in the forward fundamental channel of the CMU. The channel power is in units relative to the total CDMA power.	All

CONFigure:OVERview:MCQuality:ENVironment:LEVel:FSCH:ZERO[?] F-SCH0 Level
<SCH0 Level>

<SCH0 Level>	Description of parameters	Def. value	Def. unit	FW vers.
–20.0 dB to –7.0 dB | OFF	F-SCH0 Level F-SCH0 switched off	OFF	dB	V3.20

Description of command	Sig. State
This command determines the level in the forward SCH0 channel of the CMU. The channel power is in units relative to the total CDMA power.	All

CONFigure:OVERview:MCQuality:ENVironment:LEVel:FSCH:ONE[?] F-SCH1 Level
<SCH1 Level>

<SCH1 Level>	Description of parameters	Def. value	Def. unit	FW vers.
–20.0 dB to –7.0 dB | OFF	F-SCH1 Level F-SCH1 switched off	OFF	dB	V3.20

Description of command	Sig. State
This command determines the level in the forward SCH1 channel of the CMU. The channel power is in units relative to the total CDMA power.	All

CONFigure:OVERview:MCQuality:ENVironment:EBNT:FFCH? F-FCH Eb/Nt
<Eb/Nt>

<Eb/Nt>	Description of parameters	Def. value	Def. unit	FW vers.
–30.969 dB to 18.072 dB	Calculated F-FCH Eb/Nt	–	dB	V3.20

Description of command	Sig. State
This command is always a query. It returns the calculated signal to noise ratio for the forward FCH. This quantity is undefined unless the AWGN generator is turned on (`CONFigure:OVERview:MCQuality:ENVironment:IMPairments:LEVel:AWGN`). The quoted range of values is valid for data rates between 9.6 kbps and 153.6 kbps; see *Eb/Nt Calculation* in Chapter 4.	All

CONFigure:OVERview:MCQuality:ENVironment:EBNT:FSCH:ZERO? F-SCH0 Eb/Nt
<Eb/Nt>

<Eb/Nt>	Description of parameters	Def. value	Def. unit	FW vers.
–30.969 dB to 18.072 dB	Calculated F-SCH0 Eb/Nt	–	dB	V3.20

Description of command	Sig. State
This command is always a query. It returns the calculated signal to noise ratio for the forward SCH0. This quantity is undefined unless the AWGN generator is turned on (`CONFigure:OVERview:MCQuality:ENVironment:IMPairments:LEVel:AWGN`). The quoted range of values is valid for data rates between 9.6 kbps and 153.6 kbps; see *Eb/Nt Calculation* in Chapter 4.	All

CONFigure:OVERview:MCQuality:ENVironment:EBNT:FSCH:ONE? F-SCH1 Eb/Nt
<Eb/Nt>

<Eb/Nt>	Description of parameters	Def. value	Def. unit	FW vers.
–30.969 dB to 18.072 dB	Calculated F-SCH1 Eb/Nt	–	dB	V3.20

Description of command	Sig. State
This command is always a query. It returns the calculated signal to noise ratio for the forward SCH1. This quantity is undefined unless the AWGN generator is turned on (`CONFigure:OVERview:MCQuality:ENVironment:IMPairments:LEVel:AWGN`). The quoted range of values is valid for data rates between 9.6 kbps and 153.6 kbps; see *Eb/Nt Calculation* in Chapter 4.	All

CONFigure:OVERview:MCQuality:ENVironment:FRATe:FFCH[?] Frame Rate
<Frame Rate>

<Frame Rate>	Description of parameters	Def. value	Def. unit	FW vers.
EIGHth | QUARter | HALF | FULL | DEFault	Frames at 1/8 of the rate set Frames at 1/4 of the rate set Frames at 1/2 of the rate set Frames at the full rate set	FULL	–	V3.20

Description of command	Sig. State
This command sets the frame rate for the variable rate traffic channel.	All

CONFigure:OVERview:MCQuality:ENVironment:IMPairments:AWGN[?] AWGN Level
<AWGN Level>

<AWGN Level>	Description of parameters	Def. value	Def. unit	FW vers.
–20.0 dB to +4.0 dB | DEFault | MINimum | MAXimum | OFF,	AWGN level Sets the value to the default setting Sets the value to the range minimum Sets the value to the range maximum	OFF	dB	V3.20

Description of command	Sig. State
This command determines an Additional White Gaussian Noise level to impair the CMU output signal.	All

CONFigure:OVERview:MCQuality:ENVironment:IMPairments:FOFFset[?] BS Frequency Offset
<BS Freq Offset>

<BS Freq Offset>	Description of parameters	Def. value	Def. unit	FW vers.
–50.0 kHz to +50.0 kHz | DEFault | MINimum | MAXimum | OFF	BS frequency offset Sets the value to the default setting Sets the value to the range minimum Sets the value to the range maximum	OFF	Hz	V3.20

Description of command	Sig. State
This command determines a frequency offset to impair the CMU output signal.	All

CONFigure:OVERview:MCQuality:ENVironment:IMPairments[?] ***<FER>***				Injected Tx FER
<FER>	Description of parameters	Def. value	Def. unit	FW vers.
0% to 50% | OFF | ON	Injected Tx FER Switch FER injection off (equiv. to 0%) Re-activate FER injection, using the previously defined value	OFF	–	V3.20
Description of command				Sig. State
This command defines a percentage of faulty (i.e. erasure) frames that the CMU injects into all traffic channels of its BS Signal.				All

CONFigure:OVERview:MCQuality:ENVironment:PCBits[?] ***<Power Control Bits>***				Power Control Bits
<Power Control Bits>	Description of parameters	Def. value	Def. unit	FW vers.
OFF | AUTomatic | HOLD | ADOW | AUP | RTES | PATTern	Disable power control bits Auto mode, closed-loop operation Alternating up/down control bits All power control bits down All power control bits up Range test mode Pattern defined by means of the `CONF:BSS:PCB:PATTern...` commands	AUT	–	V3.20
Description of command				Sig. State
This command selects the power control bit sequence that the CMU sends to the mobile station to control its output power.				All

General Configurations – Subsystem OVERview:PPOWer

The subsystem *OVERview:PPOWer* controls the pilot power measurement. It corresponds to the *Pilot Power* softkey in the *Overview* menu.

CONFigure:OVERview:PPOWer:ENABle[?] ***<Enable>***				Pilot Power Enable
<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | OFF	Activate/disable the pilot power report	ON	–	V3.05
Description of command				Sig. State
This command activates or disables the transmission of the pilot power measured by the mobile station.				All

[SENSe:]OVERview:PPOWer?				Pilot Power
Returned values	Description of parameters	Def. value	Def. unit	FW vers.
Reported PPower, Actual PPower	–20 dB to –7 dB –20 dB to –7 dB	INV INV	dB dB	V3.05
Description of command				Sig. State
This command is always a query. It returns the pilot power reported by the mobile station and the actual pilot power transmitted by the CMU.				All

OVERview:OVERview

The subsystem *OVERview:OVERview* controls the measurement of general power and modulation parameters. It corresponds to the *Overview Meas.* softkey in the *Overview* menu and the associated output fields and to the *Overview Configuration* menu.

Note: *The modulation scheme reference O-QPSK is optional in the commands to remain compatible with cdmaOne. O-QPSK supports radio configurations 1 and 2. H-PSK supports radio configurations 3 and 4.*

INITiate:OVERview:OVERview[:OQPSk]	Start new measurement	⇒	*RUN*
ABORt:OVERview:OVERview[:OQPSk]	Abort running measurement and switch off	⇒	*OFF*
STOP:OVERview:OVERview[:OQPSk]	Stop measurement after current stat. cycle	⇒	*STOP*
CONTinue:OVERview:OVERview[:OQPSk]	Next measurement step (*stepping mode*)	⇒	*RUN*
INITiate:OVERview:OVERview:HPSK	Start new measurement	⇒	*RUN*
ABORt:OVERview:OVERview:HPSK	Abort running measurement and switch off	⇒	*OFF*
STOP:OVERview:OVERview:HPSK	Stop measurement after current stat. cycle	⇒	*STOP*
CONTinue:OVERview:OVERview:HPSK	Next measurement step (*stepping mode*)	⇒	*RUN*

Description of command	Sig. State	FW vers.
These commands have no query form. They start and stop the overview measurement, setting it to the status indicated in the top right column.	All	V3.05

FETCh[:SCALar]:OVERview:OVERview[:OQPSk]:STATus? Measurement Status
FETCh[:SCALar]:OVERview:OVERview:HPSK:STATus?

Return	Description of parameters	Def. value	Def. unit	FW vers.
OFF |	Measurement in the OFF state (*RST or ABORt)	OFF	–	V3.05
RUN |	Running (after INITiate, CONTinue or READ)			
STOP |	Stopped (STOP)			
ERR |	OFF (could not be started)			
STEP |	Stepping mode (<stepmode>=STEP)			
RDY	Stopped according to repetition mode and stop condition			
1 to 10000 |	Counter for current statistics cycle	NONE	–	
NONE	No counting mode set			
1 to 1000	Counter for current evaluation period within a cycle	NONE	–	
NONE	Statistic count set to off			

Description of command	Sig. State
This command is always a query. It returns the status of the measurement (see Chapters 3 and 5).	All

CONFigure:OVERview:OVERview[:OQPSk]:EREPorting[?] Event Reporting
CONFigure:OVERview:OVERview:HPSK:EREPorting[?]
<Report Mode>

<Report Mode>	Description of parameters	Def. value	Def. unit	FW vers.
SRQ |	Service request	OFF	–	V3.05
SOPC |	Single operation complete			
SRSQ |	SRQ and SOPC			
OFF |	No reporting			
DEFault	Use the default setting			

Description of command	Sig. State
This command defines the events generated when the measurement is terminated or stopped (see *Event Reporting* in Chapter 5 of the CMU manual).	All

XTND:OVERview:OVERview[:OQPSk]:SBSuppress[?] Extend Sideband Suppression Measurement
XTND:OVERview:OVERview:HPSK:SBSuppress[?]

<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | OFF | DEFault	Extend sideband suppression measurement (4 offset freq.) Sideband suppression measurement (1 offset frequency) Use the default setting	OFF	–	V3.10

Description of command	Sig. State
This command enables or disables the extended input and output arrays for the sideband suppression measurement, see commands `CONFigure:OVERview:OVERview:...LIMit...`, `READ[:SCALar]:OVERview:OVERview...`, `FETCh[:SCALar]:OVERview:OVERview...`, `SAMPle[:SCALar]:OVERview:OVERview...` and `CALCulate[:SCALar]:OVERview:OVERview...MATChing:LIMit`. The measurement of the upper and lower sideband suppression at the four offset frequencies can be enabled or disabled separately; see commands `CONFigure:OVERview:OVERview:<Application>:CONTrol:FOFFset:SBSuppress:ACP<nr>`.	All

Subsystem OVERview:OVERview:CONTrol

The subsystem *OVERview:OVERview:CONTrol* defines the repetition mode, statistic count, and stop condition of the measurement. These settings are provided in the *Control* and *Statistics* tabs of the popup menu *Overview Configuration.*

Note: *The modulation scheme reference O-QPSK is optional in the commands to remain compatible with cdmaOne. O-QPSK supports radio configurations 1 and 2. H-PSK supports radio configurations 3 and 4.*

CONFigure:OVERview:OVERview[:OQPSk]:CONTrol[?] Scope of Measurement
CONFigure:OVERview:OVERview:HPSK:CONTrol[?]
<Statistic Count>, <Repetition>, <Stop Cond>, <Step Mode>

<Statistic Count>	Description of parameters	Def. value	Def. unit	
1 to 1000,	Number of bursts per statistics cycle	100	–	
<Repetition>	Description of parameters	Def. value	Def. unit	
1 to 10000 | CONTinuous | SINGleshot | DEFault,	Multiple measurement (counting, until Status = STEP | RDY) Continuous measurement (until STOP or ABORT) Single shot measurement (until Status = RDY) Default setting	SING	–	
<Stop Cond>	Description of parameters	Def. value	Def. unit	
NONE | SONerror | DEFault,	Continue measurement even in case of error Stop measurement in case of error *(stop on error)* Default setting	NONE	–	
<Step Mode>	Description of parameters	Def. value	Def. unit	FW-Vers.
STEP | NONE | DEFault	Interrupt measurement after each statistics cycle Continue measurement according to its rep. Mode Default setting	NONE	–	V3.05

Description of command	Sig. State
This command combines the `...CONTrol:STATistics` and the `...CONTrol:REPetition` commands, see below.	All

CONFigure:OVERview:OVERview[:OQPSk]:CONTrol:STATistics[?]
CONFigure:OVERview:OVERview:HPSK:CONTrol:STATistics[?]
<Statistic Count>

Elapsed Statistic

<Statistic Count>	Description of parameters	Def. value	Def. unit	FW-Vers.
1 to 1000	Number of bursts per statistics cycle	100	–	V3.05

Description of command	Sig. State
This command specifies the type of measured values and defines the number of bursts forming a statistics cycle.	All

CONFigure:OVERview:OVERview[:OQPSk]:CONTrol:REPetition[?]
CONFigure:OVERview:OVERview:HPSK:CONTrol:REPetition[?]
<Repetition>, <Stop Cond>, <Step Mode>

Test Cycles

<Repetition>	Description of parameters	Def. value	Def. unit	
1 to 10000 |	Multiple measurement (counting, until Status = STEP | RDY	SING	–	
CONTinuous |	Continuous measurement (until STOP or ABORT)			
SINGleshot |	Single shot measurement (until Status = RDY)			
DEFault,	Default value			
<Stop Cond>	**Description of parameters**	**Def. value**	**Def. unit**	
NONE |	Continue measurement even in case of error	NONE	–	
SONerror |	Stop measurement in case of error *(stop on error)*			
DEFault,	Default value			
<Step Mode>	**Description of parameters**	**Def. value**	**Def. unit**	**FW vers.**
NONE |	Continue measurement according to its rep. mode	NONE	–	V3.05
STEP |	Interrupt measurement after each statistics cycle			
DEFault	Default value			

Description of command	Sig. State
This command determines the repetition mode, stop condition, and stepping mode for the measurement. **Note:** *In the case of READ commands (`READ:...`), the <Repetition> parameter has no effect; the measurement is always stopped after a single shot.*	All

CONFigure:OVERview:OVERview[:OQPSk]:CONTrol:FOFFset:SBSuppress[?]
CONFigure:OVERview:OVERview:HPSK:CONTrol:FOFFset:SBSuppress[?]
<SB Freq. Offset>

Injected Tx FER

<SB Freq. Offset>	Description of parameters	Def. value	Def. unit	FW vers.
–1.6 MHz to +1.6 MHz |	Sideband Suppression Frequency Offset setting	900000	Hz	V3.05
DEFault |	Default value			
MINimum |				
MAXimum |				
OFF	No frequency offset			

Description of command	Sig. State
This command determines a frequency offset to impair the signal for the sideband suppression measurement.	All

Sideband Frequency Offset

CONFigure:OVERview:OVERview[:OQPSk]:CONTrol:FOFFset:SBSuppress:ACP<nr>[?]
CONFigure:OVERview:OVERview:HPSK:CONTrol:FOFFset:SBSuppress:ACP<nr>[?]
<Freq. Offset>

<Freq. Offset>	Description of parameters	Def. value	Def. unit	FW vers.
0 to 2 MHz | DEF | MIN | MAX | OFF	Sideband frequency offset Sets the value to the default setting | minimum | maximum Measurement disabled, result INV	see below	Hz	V3.10

Description of command

This command sets up to 4 frequency offset values (<nr> = 1 to 4) used for the sideband suppression power measurement. The default values are 90 000 Hz for <nr> = 1, 1980 000 Hz for <nr> = 2 and OFF for the two remaining frequency offset values. The sideband suppression measurement yields 4 pairs of results corresponding to symmetrical frequency offsets to the RF frequency (command `[SENSe:]RFANalyzer:FREQuency[?]`).

Subsystem OVERview:OVERview:LIMit

The subsystem *OVERview:OVERview:...LIMit* defines the tolerance values for the overview measurement. The subsystem corresponds to the *Overview Limits* section in the *Limits* tab in the popup menu *Overview Configuration.*

Note: *The modulation scheme reference O-QPSK is optional in the commands to remain compatible with cdmaOne. O-QPSK supports radio configurations 1 and 2. H-PSK supports radio configurations 3 and 4.*

Limits

CONFigure:OVERview:OVERview[:OQPSk]:CMMax:LIMit[:SCALar]:SYMMetric[:COMBined][?]
CONFigure:OVERview:OVERview:HPSK:CMMax:LIMit[:SCALar]:SYMMetric[:COMBined][?]
<Carrier Freq. Error>, <Enable>, <Transmit Time Error>, <Enable>, <Waveform Quality>, <Enable>, <Sideband Suppr. 1>, <Enable>, <Sideband Suppr. 2>, <Enable>, <Sideband Suppr. 3>, <Enable>, <Sideband Suppr. 4>, <Enable>

<Enable>	Description of parameters	Def. value	Def. unit	
ON | OFF,	Switch limit check for parameter preceding *<Enable>* on or off	ON	–	
<Carrier Freq. Error>	Description of parameters	Def. value	Def. unit	
0.0 Hz to +1000.0 Hz,	Upper limit for carrier frequency error	+300	Hz	
<Transmit Time Error>	Description of parameters	Def. value	Def. unit	
0.0 µs to 10.0 µs,	Upper limit for transmit time error	1.0	µs	
<Waveform Quality>	Description of parameters	Def. value	Def. unit	
0.0 to 1.0,	Lower limit for waveform quality	0.944	–	
<Sideband Suppr. 1>	Description of parameters	Def. value	Def. unit	FW vers.
–128 to 0,	Limit for sideband suppression at frequ. offset 1	–43	dB	V3.05
<Sideband Suppr. 2>	Description of parameters	Def. value	Def. unit	FW vers.
–128 dB to 0 dB,	Limit for sideband suppression at frequ. offset 2	–54	dB	V3.10
<Sideband Suppr. 3>	Description of parameters	Def. value	Def. unit	FW vers.
–128 dB to 0 dB,	Limit for sideband suppression at frequ. offset 3	–43	dB	V3.10
<Sideband Suppr. 4>	Description of parameters	Def. value	Def. unit	FW vers.
–128 dB to 0 dB	Limit for sideband suppression at frequ. offset 4	–43	dB	V3.10

Description of command	Sig. State
This command defines upper limits for the different traces and for the scalar modulation parameters derived from them. The keywords `CMMax` and `AVERage` refer to the *Current* and *Max./Min.* display and *Average* display, respectively. After each parameter definition, the limit check for this parameter can be enabled or disabled. The values *<Sideband Suppr. 2>*, *<Sideband Suppr. 3>*, *<Sideband Suppr. 4>* and the corresponding <Enable> parameters are only available if the sideband suppression extension is enabled; see command `XTND:OVERview:OVERview:<Application>:SBSuppress`. Limit definition and enabling of the limit check can be done separately.	All

Limits

CONFigure:OVERview:OVERview[:OQPSk]:AVERage:LIMit[:SCALar]:SYMMetric[:COMBined][?]
CONFigure:OVERview:OVERview:HPSK:AVERage:LIMit[:SCALar]:SYMMetric[:COMBined][?]
<Carrier Freq. Error>, <Enable>, <Transmit Time Error>, <Enable>, <Waveform Quality>, <Enable>, <Sideband Suppr. 1>, <Enable>, <Sideband Suppr. 2>, <Enable>, <Sideband Suppr. 3>, <Enable>, <Sideband Suppr. 4>, <Enable>

<Enable>	Description of parameters	Def. value	Def. unit	
ON | OFF,	Switch limit check for parameter preceding *<Enable>* on or off	ON	–	
<Carrier Freq. Error>	Description of parameters	Def. value	Def. unit	
0.0 Hz to +1000.0 Hz,	Upper limit for carrier frequency error	+300	Hz	
<Transmit Time Error>	Description of parameters	Def. value	Def. unit	
0.0 μs to 10.0 μs,	Upper limit for transmit time error	1.0	μs	
<Waveform Quality>	Description of parameters	Def. value	Def. unit	
0.0 to 1.0,	Lower limit for waveform quality	0.944	–	
<Sideband Suppr. 1>	Description of parameters	Def. value	Def. unit	FW vers.
–128 to 0,	Limit for sideband suppression at frequ. offset 1	–43	dB	V3.05
<Sideband Suppr. 2>	Description of parameters	Def. value	Def. unit	FW vers.
–128 dB to 0 dB,	Limit for sideband suppression at frequ. offset 2	–54	dB	V3.10
<Sideband Suppr. 3>	Description of parameters	Def. value	Def. unit	FW vers.
–128 dB to 0 dB ,	Limit for sideband suppression at frequ. offset 3	–43	dB	V3.10
<Sideband Suppr. 4>	Description of parameters	Def. value	Def. unit	FW vers.
–128 dB to 0 dB	Limit for sideband suppression at frequ. offset 4	–43	dB	V3.10

Description of command	Sig. State
This command defines upper limits for the different traces and for the scalar modulation parameters derived from them. The keywords `CMMax` and `AVERage` refer to the *Current* and *Max./Min.* display and *Average* display, respectively. After each parameter definition, the limit check for this parameter can be enabled or disabled. The values *<Sideband Suppr. 2>, <Sideband Suppr. 3>, <Sideband Suppr. 4>* and the corresponding <Enable> parameters are only available if the sideband suppression extension is enabled; see command `XTND:OVERview:OVERview:<Application>:SBSuppress`. Limit definition and enabling of the limit check can be done separately.	All

Limit Enable

CONFigure:OVERview:OVERview[:OQPSk]:CMMax:LIMit[:SCALar]:SYMMetric[:COMBined]:ENABle[?]
CONFigure:OVERview:OVERview:HPSK:CMMax:LIMit[:SCALar]:SYMMetric[:COMBined]:ENABle[?]

<Carrier Freq Error>, <Transmit Time Error>, <Waveform Quality>, <Sideband Suppr. 1>, <Sideband Suppr. 2>, <Sideband Suppr. 3>, <Sideband Suppr. 4>

<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | OFF	Switch limit check for corresponding parameter on or off.	ON	–	V3.05

Description of command	Sig. State
This command enables or disables the limit check for the different traces and for the scalar modulation parameters derived from them. The keywords `CMMax` and `AVERage` refer to the *Current* and *Max./Min.* display and *Average* display, respectively. The values *<Sideband Suppr. 2>, <Sideband Suppr. 3>, <Sideband Suppr. 4>* are only available if the sideband suppression extension is enabled; see command `XTND:OVERview:OVERview:<Application>:SBSuppress`.	All

Limit Enable

CONFigure:OVERview:OVERview[:OQPSk]:AVERage:LIMit[:SCALar]:SYMMetric[:COMBined]:ENABle[?]
CONFigure:OVERview:OVERview:HPSK:AVERage:LIMit[:SCALar]:SYMMetric[:COMBined]:ENABle[?]

<Carrier Freq Error>, <Transmit Time Error>, <Waveform Quality>, <Sideband Suppr. 1>, <Sideband Suppr. 2>, <Sideband Suppr. 3>, <Sideband Suppr. 4>

<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | OFF	Switch limit check for corresponding parameter on or off.	ON	–	V3.05

Description of command	Sig. State
This command enables or disables the limit check for the different traces and for the scalar modulation parameters derived from them. The keywords `CMMax` and `AVERage` refer to the *Current* and *Max./Min.* display and *Average* display, respectively. The values *<Sideband Suppr. 2>, <Sideband Suppr. 3>, <Sideband Suppr. 4>* are only available if the sideband suppression extension is enabled; see command `XTND:OVERview:OVERview:<Application>:SBSuppress`.	All

Overview Limits

CONFigure:OVERview:OVERview[:OQPSk]:CMMax:LIMit[:SCALar]:SYMMetric[:COMBined]:VALue[?]
CONFigure:OVERview:OVERview:HPSK:CMMax:LIMit[:SCALar]:SYMMetric[:COMBined]:VALue[?]
<Carrier Freq. Error>, <Transmit Time Error>, <Waveform Quality>, <Sideband Suppr. 1>, <Sideband Suppr. 2>, <Sideband Suppr. 3>, <Sideband Suppr. 4>

<Carrier Freq. Error>	Description of parameters	Def. value	Def. unit	
0.0 Hz to +1000.0 Hz,	Upper limit for carrier frequency error	+300	Hz	
<Transmit Time Error>	Description of parameters	Def. value	Def. unit	
0.0 µs to 10.0 µs,	Upper limit for transmit time error	1.0	µs	
<Waveform Quality>	Description of parameters	Def. value	Def. unit	
0.0 to 1.0,	Lower limit for waveform quality	0.944	–	
<Sideband Suppr. 1>	Description of parameters	Def. value	Def. unit	FW vers.
–128 to 0	Upper sideband suppression limit	–43	dB	V3.05
<Sideband Suppr. 2>	Description of parameters	Def. value	Def. unit	FW vers.
–128 dB to 0 dB ,	Limit for sideband suppression at frequ. offset 2	–54	dB	V3.10
<Sideband Suppr. 3>	Description of parameters	Def. value	Def. unit	FW vers.
–128 dB to 0 dB,	Limit for sideband suppression at frequ. offset 3	–43	dB	V3.10
<Sideband Suppr. 4>	Description of parameters	Def. value	Def. unit	FW vers.
–128 dB to 0 dB	Limit for sideband suppression at frequ. offset 4	–43	dB	V3.10

Description of command	Sig. State
This commands defines the upper limits for the overview measurement. The keywords `CMMax` and `AVERage` refer to the *Current* and *Max./Min.* display and *Average* display, respectively. The values *<Sideband Suppr. 2>, <Sideband Suppr. 3>, <Sideband Suppr. 4>* are only available if the sideband suppression extension is enabled; see command `XTND:OVERview:OVERview:<Application>:SBSuppress`.	All

Overview Limits

CONFigure:OVERview:OVERview[:OQPSk]:AVERage:LIMit[:SCALar]:SYMMetric[:COMBined]:VALue[?]
CONFigure:OVERview:OVERview:HPSK:AVERage:LIMit[:SCALar]:SYMMetric[:COMBined]:VALue[?]
<Carrier Freq Error>, <Transmit Time Error>, <Waveform Quality>, <Sideband Suppr. 1>, <Sideband Suppr. 2>, <Sideband Suppr. 3>, <Sideband Suppr. 4>

<Carrier Freq. Error>	Description of parameters	Def. value	Def. unit	
0.0 Hz to +1000.0 Hz,	Upper limit for carrier frequency error	+300	Hz	
<Transmit Time Error>	Description of parameters	Def. value	Def. unit	
0.0 µs to 10.0 µs,	Upper limit for transmit time error	1.0	µs	
<Waveform Quality>	Description of parameters	Def. value	Def. unit	
0.0 to 1.0,	Lower limit for waveform quality	0.944	–	
<Sideband Suppr. 1>	Description of parameters	Def. value	Def. unit	FW vers.
–128 to 0	Upper sideband suppression limit	–43	dB	V3.05
<Sideband Suppr. 2>	Description of parameters	Def. value	Def. unit	FW vers.
–128 dB to 0 dB,	Limit for sideband suppression at frequ. offset 2	–54	dB	V3.10
<Sideband Suppr. 3>	Description of parameters	Def. value	Def. unit	FW vers.
–128 dB to 0 dB,	Limit for sideband suppression at frequ. offset 3	–43	dB	V3.10
<Sideband Suppr. 4>	Description of parameters	Def. value	Def. unit	FW vers.
–128 dB to 0 dB	Limit for sideband suppression at frequ. offset 4	–43	dB	V3.10

Description of command	Sig. State
This commands defines the upper limits for the overview measurement. The keywords `CMMax` and `AVERage` refer to the *Current* and *Max./Min.* display and *Average* display, respectively. The values *<Sideband Suppr. 2>, <Sideband Suppr. 3>, <Sideband Suppr. 4>* are only available if the sideband suppression extension is enabled; see command `XTND:OVERview:OVERview:<Application>:SBSuppress`.	All

Default Settings

DEFault:OVERview:OVERview[:OQPSk]:LIMit[?]
DEFault:OVERview:OVERview:HPSK:LIMit[?]
<Enable>

Enable	Description of parameters	Def. value	Def. unit	FW vers.
ON | OFF	The parameters are set to their default values Some or all parameters are not set to default	ON	–	V3.05

Description of command	Sig. State
If used as a setting command with the parameter *ON,* this command sets all parameters of the subsystem OVERview:OVERview:LIMit to their default values (the setting OFF results in an error message). The length of the parameter lists in the commands is not affected. If used as a query, the command returns whether all parameters are set to their default values *(ON)* or not *(OFF).*	All

Measured Values – Subsystem OVERview:OVERview

The subsystem *OVERview:OVERview* determines and outputs the results of the overview measurement. In the *Overview* menu, it corresponds to the output fields associated to the *Overview Meas.* softkey.

Note: *The modulation scheme reference O-QPSK is optional in the commands to remain compatible with cdmaOne. O-QPSK supports radio configurations 1 and 2. H-PSK supports radio configurations 3 and 4.*

	Scalar results:
READ[:SCALar]:OVERview:OVERview[:OQPSk]?	Start single shot measurement and return results
FETCh[:SCALar]:OVERview:OVERview[:OQPSk]?	Read out measurement results (unsynchronized)
SAMPle[:SCALar]:OVERview:OVERview[:OQPSk]?	Read out measurement results (synchronized)
READ[:SCALar]:OVERview:OVERview:HPSK?	Start single shot measurement and return results
FETCh[:SCALar]:OVERview:OVERview:HPSK?	Read out measurement results (unsynchronized)
SAMPle[:SCALar]:OVERview:OVERview:HPSK?	Read out measurement results (synchronized)

Returned values	Description of parameters	Def. value	Def. unit	FW vers.
Expected MS Power (x1),	–100 dB to 10 dB	NAN	dBm	V3.05
Measured MS Power (x3),	–100 dB to 10 dB	NAN	dBm	
Expected Carrier Frequency (x1),	0 to 1000.0 Hz	NAN	MHz	
Carrier Frequency Error (x3),	0 to 1000.0 Hz	NAN	Hz	
Transmit Time Error (x3),	0.0 µs to 10.0 µs	NAN	µs	
Waveform Quality (x3),	0.0 to 1.0	NAN	–	
Lower Sideband Supp. 1 (x3),	–128 dB to 0	NAN	dB	
Upper Sideband Supp. 1 (x3)	–128 dB to 0	NAN	dB	
Lower Sideband Supp. 2 (x3),	–128 dB to 0	NAN	dB	V3.10
Upper Sideband Supp. 2 (x3)	–128 dB to 0	NAN	dB	V3.10
Lower Sideband Supp. 3 (x3),	–128 dB to 0	NAN	dB	V3.10
Upper Sideband Supp. 3 (x3)	–128 dB to 0	NAN	dB	V3.10
Lower Sideband Supp. 4 (x3),	–128 dB to 0	NAN	dB	V3.10
Upper Sideband Supp. 4 (x3)	–128 dB to 0	NAN	dB	V3.10

Description of command	Sig. State
These commands are always queries. They start a measurement and output all scalar measurement results (see Chapter 5). The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average*, and the *MMax* value. Sideband Supp. 1 to Sideband Supp. 4 denotes the sideband suppression at offset frequencies 1 to 4; see commands `CONFigure:OVERview:OVERview<Application>:CONTrol:FOFFset:SBSuppress:ACP<nr>`. The sideband suppression values 2 to 4 are available only if the measurement is enabled; see commands `XTND:OVERview:OVERview: <Application>:SBSuppress`.	All

CALCulate[:SCALar]:OVERview:OVERview[:OQPSk]:MATChing:LIMit?
CALCulate[:SCALar]:OVERview:OVERview:HPSK:MATChing:LIMit? Limit Matching

Returned values	Value range	Def. value	Def. unit	FW vers.
Carrier Frequency Error (x3),		INV	–	V3.05
Transmit Time Error (x3),	For all values:	INV	–	
Waveform Quality (x3),		INV	–	
Lower Sideband Supp. 1 (x3),	NMAU | NMAL | INV | OK	INV	–	
Upper Sideband Supp. 1 (x3)		INV	–	
Lower Sideband Supp. 2 (x3),		INV	–	V3.10
Upper Sideband Supp. 2 (x3)		INV	–	V3.10
Lower Sideband Supp. 3 (x3),		INV	–	V3.10
Upper Sideband Supp. 3 (x3)		INV	–	V3.10
Lower Sideband Supp. 4 (x3),		INV	–	V3.10
Upper Sideband Supp. 4 (x3)		INV	–	V3.10

Description of command	Sig. State
This command is always a query. It indicates whether and in which way the tolerances for the overview measurement have been exceeded. The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average,* and the *MMax* value. The following messages may be generated: NMAU Tolerance value underflow *not matching, underflow* NMAL Tolerance value exceeded *not matching, overflow* INV Measurement invalid *invalid* OK Tolerance value matched Sideband Supp. 1 to Sideband Supp. 4 denotes the sideband suppression at offset frequencies 1 to 4; see commands `CONFigure:OVERview:OVERview<Application>:CONTrol:FOFFset :SBSuppress:ACP<nr>`. The sideband suppression values 2 to 4 are available only if the measurement is enabled; see commands `XTND:OVERview:OVERview:<Application> :SBSuppress`.	All

OVERview:CQUality

The subsystem *OVERview:CQUality* controls the measurement of general channel quality parameters. It corresponds to the *Channel Quality* hotkey in the *Overview* menu and the associated output fields and to the *Channel Quality* sections of the *Overview Configuration* menu.

INITiate:OVERview:CQUality	Start new measurement	⇒ RUN	
ABORt:OVERview:CQUality	Abort running measurement and switch off	⇒ OFF	
STOP:OVERview:CQUality	Stop measurement after current stat. cycle	⇒ STOP	
CONTinue:OVERview:CQUality	Next measurement step (only stepping mode)	⇒ RUN	
Description of command		Sig. State	FW vers.
These commands have no query form. They start and stop the overview measurement, setting it to the status indicated in the top right column.		All	V3.05

CONFigure:OVERview:CQUality:EREPorting[?] Event Reporting
<Report Mode>

<Report Mode>	Description of parameters	Def. value	Def. unit	FW vers.
SRQ |	Service request	OFF	–	V3.05
SOPC |	Single operation complete			
SRSQ |	SRQ and SOPC			
OFF |	No reporting			
DEFault				

Description of command	Sig. State
This command defines the events generated when the measurement is terminated or stopped (see *Event Reporting* in Chapter 5 of the CMU manual).	All

FETCh[:SCALar]:OVERview:CQUality:STATus? Measurement Status

Return	Description of parameters	Def. value	Def. unit	FW vers.
OFF |	Measurement in the OFF state (*RST or ABORt)	OFF	–	V3.05
RUN |	Running (after INITiate, CONTinue or READ)			
STOP |	Stopped (STOP)			
ERR |	OFF (could not be started)			
STEP |	Stepping mode (<stepmode>=STEP)			
RDY	Stopped according to repetition mode and stop condition			
1 to 10000 |	Counter for current statistics cycle	NONE	–	
NONE	No counting mode set			
1 to 1000	Counter for current evaluation period within a cycle	NONE	–	
NONE	Statistic count set to off			

Description of command	Sig. State
This command is always a query. It returns the status of the measurement (see Chapters 3 and 5).	All

XTND:OVERview:CQUality:CLEVel[?] Provide Confidence Level Measurement

<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON |	Provide confidence level results	OFF	–	V3.10
OFF |	Do not return the confidence level results			
DEFault	Use the default setting			

Description of command	Sig. State
This command enables or disables the extended output arrays for the confidence level measurement, see commands `READ[:SCALar]:OVERview:CQUality?`, `FETCh[:SCALar]:OVERview:OVERview: CQUality?`, `SAMPle[:SCALar]:OVERview:OVERview:CQUality?` and `CALCulate[:SCALar]:OVERview::CQUality:MATChing:LIMit`.	All

Subsystem OVERview:CQUality:CONTrol

The subsystem *OVERview:CQUality:CONTrol* defines the statistic count, repetition mode, and stop condition of the measurement. These settings are provided in the *Control* and *Limits* tabs of the popup menu *Overview Configuration.*

CONFigure:OVERview:CQUality:CONTrol:FRAMes[?] ***<Max Frames>***				Maximum Frame Number
<Max Frames>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 10000	Maximum frames	1000	–	V3.05
Description of command				Sig. State
This command determines the maximum number of frames used to calculate the frame error rate.				All

CONFigure:OVERview:CQUality:CONTrol:REPetition[?] ***<Repetition>, <Stop Cond>, <Step Mode>***				Test Cycles
<Repetition>	Description of parameters	Def. value	Def. unit	
1 to 10000 | CONTinuous | SINGleshot | DEFault,	Multiple measurement (*counting*, until `Status = STEP | RDY`) Continuous measurement (until `STOP` or `ABORT`) Single shot measurement (until `Status = RDY`)	SING	–	
<Stop Cond>	Description of parameters	Def. value	Def. unit	
NONE | SONerror | DEFault,	Continue measurement even in case of error Stop measurement in case of error *(stop on error)*	NONE	–	
<Stop Cond>	Description of parameters	Def. value	Def. unit	
NONE | ALEX | CLEX | FLEX | DEFault,	Not aborted, measurement over all frames Measurement aborted if any limit is exceeded Measurement aborted if confidence level limit is exceeded Measurement aborted if frame limit is exceeded Sets the value to the default setting	NONE	–	
<Step Mode>	Description of parameters	Def. value	Def. unit	FW vers.
STEP | NONE | DEFault	Interrupt measurement after each statistics cycle Continue measurement according to its rep. mode	NONE	–	V3.05
Description of command				Sig. State
This command determines the repetition mode, stop condition, and stepping mode for the measurement. ***Note:*** *In the case of READ commands (`READ:...`), the <Repetition> parameter has no effect; the measurement is always stopped after a single shot.*				All

Subsystem OVERview:CQUality:LIMit

The subsystem *OVERview:CQUality:...LIMit* defines the tolerance values for the overview measurement. The subsystem corresponds to the *Channel Quality* section in the *Limits* tab in the popup menu *Overview Configuration.*

CONFigure:OVERview:CQUality:CAMMax:LIMit:MFER[?] Maximum Frame Error Rate
<Maximum FER>

<Maximum FER>	Description of parameters	Def. value	Def. unit	FW vers.
0.1% to +5.0% |	Upper limit for frame error rate	0.5	%	V3.10
OFF |	Disable limit check			
ON |	Enable limit check			
MIN | MAX | DEF	Use minimum, maximum, or default value			

Description of command	Sig. State
This commands defines the upper limit for the frame error rate in the channel quality measurement.	All

CONFigure:OVERview:CQUality:CAMMax:LIMit:CLEVel[?] Minimum Confidence Level
<Maximum FER>

<Maximum FER>	Description of parameters	Def. value	Def. unit	FW vers.
85.0 % to +99.99 % |	Upper limit for frame error rate	95.0	%	V3.10
OFF |	Disable limit check			
ON |	Enable limit check			
MIN | MAX | DEF	Use minimum, maximum, or default value			

Description of command	Sig. State
This commands defines the lower limit for the confidence level in the channel quality measurement.	All

DEFault:OVERview:CQUality:LIMit[?] Limit Default Settings
<Enable>

Enable	Description of parameters	Def. value	Def. unit	FW vers.
ON |	The parameters are set to their default values	ON	–	V3.05
OFF	Some or all parameters are not set to default			

Description of command	Sig. State
If used as a setting command with the parameter *ON,* this command sets all parameters of the subsystem OVERview:CQUality:LIMit to their default values (the setting OFF results in an error message). If used as a query, the command returns whether all parameters are set to their default values *(ON)* or not *(OFF).*	All

Measured Values – Subsystem OVERview:CQUality

The subsystem *OVERview:CQUality* determines and outputs the results of the channel quality measurement. In the *Overview* menu, it corresponds to the output fields associated to the *Channel Quality* hotkey.

READ[:SCALar]:OVERview:CQUality? **FETCh[:SCALar]:OVERview:CQUality?** **SAMPle[:SCALar]:OVERview:CQUality?**	Scalar results: Start single shot measurement and return results Read out measurement results (unsynchronized) Read out measurement results (synchronized)			
Returned values	Value range	Def. value	Def. unit	FW vers.
Frames transmitted,	1 to 1000	NAN	–	V3.05
Frame Error Rate	0% to 100%	NAN	%	V3.05
Confidence Level	0% to 100%	NAN	%	V3.10
Description of command				Sig. State
These commands are always queries. They start a measurement and output all scalar measurement results (see Chapter 5). The confidence level is available only if the measurment is enabled; see command `XTND:OVERview:CQUality:CLEVel`.				All

CALCulate[:SCALar]:OVERview:CQUality:MATChing:LIMit?	Limit Matching			
Returned values	Value range	Def. value	Def. unit	FW vers.
FER Limit, Confidence Level	For all values: NMAU | NMAL | INV | OK	INV INV	– –	V3.05 V3.10
Description of command				Sig. State
This command is always a query. It indicates whether and in which way the tolerances for the overview measurement have been exceeded. The confidence level is available only if the measurment is enabled; see command `XTND:OVERview:CQUality:CLEVel`. The following messages may be generated: NMAU Tolerance value underflow *not matching, underflow* NMAL Tolerance value exceeded *not matching, overflow* INV Measurement invalid *invalid* OK Tolerance value matched				All

Power Measurements

The *POWer* subsystem measures the transmitter output power of the mobile station. It is divided into several subsystems corresponding to the different *Power* applications.

POWer:MIOutput

The subsystem *POWer:MIOutput* measures the MS minimum output power. The subsystem corresponds to the measurement menu *Power,* application *Minimum Output,* and the sections related to this application in the associated popup menu *Power Configuration.*

Control of measurement – Subsystem POWer:MIOutput

The subsystem *POWer:MIOutput* controls the minimum output measurement.

Note: *The modulation scheme reference O-QPSK is optional in the commands to remain compatible with cdmaOne. O-QPSK supports radio configurations 1 and 2. H-PSK supports radio configurations 3 and 4.*

INITiate:POWer:MIOutput[:OQPSk] **ABORt:POWer:MIOutput[:OQPSk]** **STOP:POWer:MIOutput[:OQPSk]** **CONTinue:POWer:MIOutput[:OQPSk]**	Start new measurement ⇒ *RUN* Abort running measurement and switch off ⇒ *OFF* Stop measurement after current stat. cycle ⇒ *STOP* Next measurement step (only *stepping mode*) ⇒ *RUN*		
INITiate:POWer:MIOutput:HPSK **ABORt:POWer:MIOutput:HPSK** **STOP:POWer:MIOutput:HPSK** **CONTinue:POWer:MIOutput:HPSK**	Start new measurement ⇒ *RUN* Abort running measurement and switch off ⇒ *OFF* Stop measurement after current stat. cycle ⇒ *STOP* Next measurement step (only *stepping mode*) ⇒ *RUN*		
Description of command		Sig. State	FW vers.
These commands have no query form. They start and stop the power measurement, setting it to the status indicated in the top right column.		All	V3.05

CONFigure:POWer:MIOutput[:OQPSk]:EREPorting[?] **CONFigure:POWer:MIOutput:HPSK:EREPorting[?]** ***<Report Mode>***				Event Reporting
<Report Mode>	Description of parameters	Def. value	Def. unit	FW vers.
SRQ | SOPC | SRSQ | OFF | DEFault	Service request Single operation complete SRQ and SOPC No reporting	OFF	–	V3.05
Description of command				Sig. State
This command defines the events generated when the measurement is terminated or stopped (see *Event Reporting* in Chapter 5 of the CMU manual).				All

FETCh[:SCALar]:POWer:MIOutput[:OQPSk]:STATus? **FETCh[:SCALar]:POWer:MIOutput:HPSK:STATus?**				Measurement Status
Return	Description of parameters	Def. value	Def. unit	FW vers.
OFF | RUN | STOP | ERR | STEP | RDY	Measurement in the OFF state (*RST or ABORt) Running (after INITiate, CONTinue or READ) Stopped (STOP) OFF (could not be started) Stepping mode (<stepmode>=STEP) Stopped according to repetition mode and stop condition	OFF	–	V3.05
1 to 10000 | NONE	Counter for current statistics cycle No counting mode set	NONE	–	
1 to 1000 NONE	Counter for current evaluation period within a cycle Statistic count set to off	NONE	–	
Description of command				Sig. State
This command is always a query. It returns the status of the measurement (see Chapters 3 and 5).				All

Subsystem POWer:MIOutput:CONTrol

The subsystem *POWer:MIOutput:CONTrol* defines the repetition mode, statistic count, and stop condition of the measurement. These settings are provided in the *Control* and *Statistics* tabs in the popup menu *Power Configuration*.

Note: *The modulation scheme reference O-QPSK is optional in the commands to remain compatible with cdmaOne. O-QPSK supports radio configurations 1 and 2. H-PSK supports radio configurations 3 and 4.*

CONFigure:POWer:MIOutput[:OQPSk]:CONTrol[?] **CONFigure:POWer:MIOutput:HPSK:CONTrol[?]** ***<Statistics>, <Repetition>, <Stop Cond>, <Step Mode>***				Scope of Measurement
<Statistics>	Description of parameters	Def. value	Def. unit	
1 to 1000,	Number of bursts per statistics cycle	100	–	
<Repetition>	Description of parameters	Def. value	Def. unit	
1 to 10000 CONTinuous | SINGleshot | DEFault,	Multiple measurement (*counting*, until `Status = STEP | RDY`) Continuous measurement (until `STOP` or `ABORT`) Single shot measurement (until `Status = RDY`)	SING	–	
<Stop Cond>	Description of parameters	Def. value	Def. unit	
NONE | SONerror | DEFault,	Continue measurement even in case of error Stop measurement in case of error *(stop on error)*	NONE	–	
<Step Mode>	Description of parameters	Def. value	Def. unit	FW-Vers.
STEP | NONE | DEFault	Interrupt measurement after each statistics cycle Continue measurement according to its rep. mode	NONE	–	V3.05
Description of command				Sig. State
This command combines the `...CONTrol:STATistics` and the `...CONTrol:REPetition` commands, see below.				All

CONFigure:POWer:MIOutput[:OQPSk]:CONTrol:STATistics[?] **CONFigure:POWer:MIOutput:HPSK:CONTrol:STATistics[?]** ***<Statistics>***				Statistic Count
<Statistics>	Description of parameters	Def. value	Def. unit	FW-Vers.
1 to 1000 | NONE	Number of bursts per statistics cycle Statistics off (equivalent to 1)	100	–	V3.05
Description of command				Sig. State
This command specifies the number of bursts forming a statistics cycle.				All

CONFigure:POWer:MIOutput[:OQPSk]:CONTrol:REPetition[?] Test Cycles
CONFigure:POWer:MIOutput:HPSK:CONTrol:REPetition[?]
<Repetition>, <Stop Cond>, <Step Mode>

<Repetition>	Description of parameters	Def. value	Def. unit	
1 to 10000	Multiple measurement (*counting*, until `Status = STEP | RDY`)	SING	–	
CONTinuous | SINGleshot | DEFault,	Continuous measurement (until `STOP` or `ABORT`) Single shot measurement (until `Status = RDY`)			
<Stop Cond>	Description of parameters	Def. value	Def. unit	
NONE | SONerror,	Continue measurement even in case of error Stop measurement in case of error *(stop on error)*	NONE	–	
<Step Mode>	Description of parameters	Def. value	Def. unit	FW vers.
STEP | NONE	Interrupt measurement after each statistics cycle Continue measurement according to its rep. mode	NONE	–	V3.05

Description of command	Sig. State
This command determines the repetition mode, stop condition, and stepping mode for the measurement. ***Note:*** *In the case of READ commands (`READ:...`), the <Repetition> parameter has no effect; the measurement is always stopped after a single shot.*	All

Test Configuration

The subsystem *POWer:MIOutput:ENVironment…* configures the generated RF signal. It corresponds to the *Measurement Environment* section in the *Control* tab of the *Power Configuration* menu. The settings are used only if the environment is enabled; see `CONFigure:POWer:MIOutput:ENVironment:ENABle`.

Note: *The modulation scheme reference O-QPSK is optional in the commands to remain compatible with cdmaOne. O-QPSK supports radio configurations 1 and 2. H-PSK supports radio configurations 3 and 4.*

CONFigure:POWer:MIOutput[:OQPSk]:ENVironment:ENABle[?] Environment Enable
CONFigure:POWer:MIOutput:HPSK:ENVironment:ENABle[?]
<Enable>

<Enable>	Description of parameters	Def. Value	Def. Unit	FW vers.
ON | OFF	Enable or disable environment	ON	–	V3.20

Description of command	Sig. State
These commands enable or disable the environment for the *Min. Power* measurement applications.	All

CONFigure:POWer:MIOutput[:OQPSk]:ENVironment:POWer:CDMA[?] CDMA Power
CONFigure:POWer:MIOutput:HPSK:ENVironment:POWer:CDMA[?]
<CDMA Power>

<CDMA Power>	Description of parameters	Def. value	Def. unit	FW vers.
–120.0 dBm to –33.0 dBm | –120.0 dBm to –16.0 dBm | –100.0 dBm to +7.0 dBm | DEFault | MINimum | MAXimum	RF1 OUT, 0 dB ext. atten RF2 OUT, 0 dB ext. atten RF3 OUT, 0 dB ext. atten Sets the value to the default setting Sets the value to the range minimum Sets the value to the range maximum	–25.0	dBm	V3.20

Description of command	Sig. State
These commands determine the total CDMA output power (absolute value, in dBm) of the CMU. The CDMA Power value range depends on the RF input used and the external attenuation set.	All

CONFigure:POWer:MIOutput[:OQPSk]:ENVironment:LEVel:FPICh[?] F-PICH Level
CONFigure:POWer:MIOutput:HPSK:ENVironment:LEVel:FPICh[?]
<Pilot Level>

<Pilot Level>	Description of parameters	Def. value	Def. unit	FW vers.
–20.0 dB to –7.0 dB | OFF	Pilot Level F-PICH switched off	–7.0	dB	V3.20

Description of command	Sig. State
These commands determine the level in the forward pilot channel of the CMU. The channel power is in units relative to the total CDMA power.	All

CONFigure:POWer:MIOutput[:OQPSk]:ENVironment:LEVel:FFCH[?] F-FCH Level
CONFigure:POWer:MIOutput:HPSK:ENVironment:LEVel:FFCH[?]
<FCH Level>

<FCH Level>	Description of parameters	Def. value	Def. unit	FW vers.
–20.0 dB to –7.0 dB | OFF	FCH Level F-FCH switched off	–7.4	dB	V3.20

Description of command	Sig. State
These commands determines the level in the forward fundamental channel of the CMU. The channel power is in units relative to the total CDMA power.	All

CONFigure:POWer:MIOutput[:OQPSk]:ENVironment:LEVel:FSCH:ZERO[?] F-SCH0 Level
CONFigure:POWer:MIOutput:HPSK:ENVironment:LEVel:FSCH:ZERO[?]
<SCH0 Level>

<SCH0 Level>	Description of parameters	Def. value	Def. unit	FW vers.
–20.0 dB to –7.0 dB | OFF	F-SCH0 Level F-SCH0 switched off	OFF	dB	V3.20

Description of command	Sig. State
These commands determine the level in the forward SCH0 channel of the CMU. The channel power is in units relative to the total CDMA power.	All

CONFigure:POWer:MIOutput[:OQPSk]:ENVironment:LEVel:FSCH:ONE[?] F-SCH1 Level
CONFigure:POWer:MIOutput:HPSK:ENVironment:LEVel:FSCH:ONE[?]
<SCH1 Level>

<SCH1 Level>	Description of parameters	Def. value	Def. unit	FW vers.
–20.0 dB to –7.0 dB | OFF	F-SCH1 Level F-SCH1 switched off	OFF	dB	V3.20

Description of command	Sig. State
These commands determine the level in the forward SCH1 channel of the CMU. The channel power is in units relative to the total CDMA power.	All

CONFigure:POWer:MIOutput[:OQPSk]:ENVironment:EBNT:FFCH? F-FCH Eb/Nt
CONFigure:POWer:MIOutput:HPSK:ENVironment:EBNT:FFCH?
<Eb/Nt>

<Eb/Nt>	Description of parameters	Def. value	Def. unit	FW vers.
–30.969 dB to 18.072 dB	Calculated F-FCH Eb/Nt	–	dB	V3.20

Description of command	Sig. State
These commands are always queries. They return the calculated signal to noise ratio for the forward FCH. This quantity is undefined unless the AWGN generator is turned on (`CONFigure:POWer:MIOutput[:OQPSk]:ENVironment:IMPairments:LEVel:AWGN`). The quoted range of values is valid for data rates between 9.6 kbps and 153.6 kbps; see *Eb/Nt Calculation* in Chapter 4.	All

CONFigure:POWer:MIOutput:HPSK:ENVironment:EBNT:FSCH:ZERO? F-SCH0 Eb/Nt
CONFigure:POWer:MIOutput[:OQPSk]:ENVironment:EBNT:FSCH:ZERO?
<Eb/Nt>

<Eb/Nt>	Description of parameters	Def. value	Def. unit	FW vers.
–30.969 dB to 18.072 dB	Calculated F-SCH0 Eb/Nt	–	dB	V3.20

Description of command	Sig. State
These commands are always queries. They return the calculated signal to noise ratio for the forward SCH0. This quantity is undefined unless the AWGN generator is turned on (`CONFigure:POWer:MIOutput:HPSK:ENVironment:IMPairments:LEVel:AWGN`). The quoted range of values is valid for data rates between 9.6 kbps and 153.6 kbps; see *Eb/Nt Calculation* in Chapter 4.	All

CONFigure:POWer:MIOutput[:OQPSk]:ENVironment:EBNT:FSCH:ONE? F-SCH1 Eb/Nt
CONFigure:POWer:MIOutput:HPSK:ENVironment:EBNT:FSCH:ONE?
<Eb/Nt>

<Eb/Nt>	Description of parameters	Def. value	Def. unit	FW vers.
–30.969 dB to 18.072 dB	Calculated F-SCH1 Eb/Nt	–	dB	V3.20

Description of command	Sig. State
These commands are always queries. They return the calculated signal to noise ratio for the forward SCH1. This quantity is undefined unless the AWGN generator is turned on (`CONFigure:POWer:MIOutput[:OQPSk]:ENVironment:IMPairments:LEVel:AWGN`). The quoted range of values is valid for data rates between 9.6 kbps and 153.6 kbps; see *Eb/Nt Calculation* in Chapter 4.	All

CONFigure:POWer:MIOutput[:OQPSk]:ENVironment:FRATe:FFCH[?] **CONFigure:POWer:MIOutput:HPSK:ENVironment:FRATe:FFCH[?]** ***<Frame Rate>***				Frame Rate
<Frame Rate>	Description of parameters	Def. value	Def. unit	FW vers.
EIGHth | QUARter | HALF | FULL | DEFault	Frames at 1/8 of the rate set Frames at 1/4 of the rate set Frames at 1/2 of the rate set Frames at the full rate set	FULL	–	V3.20
Description of command				Sig. State
These commands set the frame rate for the variable rate traffic channel.				All

CONFigure:POWer:MIOutput[:OQPSk]:ENVironment:IMPairments:AWGN[?] **CONFigure:POWer:MIOutput:HPSK:ENVironment:IMPairments:AWGN[?]** ***<AWGN Level>***				AWGN Level
<AWGN Level>	Description of parameters	Def. value	Def. unit	FW vers.
–20.0 dB to +4.0 dB | DEFault | MINimum | MAXimum | OFF,	AWGN level Sets the value to the default setting Sets the value to the range minimum Sets the value to the range maximum	OFF	dB	V3.20
Description of command				Sig. State
These commands determine an Additional White Gaussian Noise level to impair the CMU output signal.				All

CONFigure:POWer:MIOutput[:OQPSk]:ENVironment:IMPairments:FOFFset[?] **CONFigure:POWer:MIOutput:HPSK:ENVironment:IMPairments:FOFFset[?]** ***<BS Freq Offset>***				BS Frequency Offset
<BS Freq Offset>	Description of parameters	Def. value	Def. unit	FW vers.
–50.0 kHz to +50.0 kHz | DEFault | MINimum | MAXimum | OFF	BS frequency offset Sets the value to the default setting Sets the value to the range minimum Sets the value to the range maximum	OFF	Hz	V3.20
Description of command				Sig. State
These commands determine a frequency offset to impair the CMU output signal.				All

CONFigure:POWer:MIOutput[:OQPSk]:ENVironment:IMPairments:ITFer[?] Injected Tx FER
CONFigure:POWer:MIOutput:HPSK:ENVironment:IMPairments:ITFer[?]
<FER>

<FER>	Description of parameters	Def. value	Def. unit	FW vers.
0% to 50% | OFF | ON	Injected Tx FER Switch FER injection off (equiv. to 0%) Re-activate FER injection, using the previously defined value	OFF	–	V3.20

Description of command	Sig. State
These commands define a percentage of faulty (i.e. erasure) frames that the CMU injects into all traffic channels of its BS Signal.	All

CONFigure:POWer:MIOutput[:OQPSk]:ENVironment:PCBits? Power Control Bits
CONFigure:POWer:MIOutput:HPSK:ENVironment:PCBits?
<Power Control Bits>

Response	Description of parameters	Def. value	Def. unit	FW vers.
ADOW	All power control bits down	–	–	V3.20

Description of command	Sig. State
These commands are always queries. They return the fixed Power Control Bit sequence of the *Min. Power* application.	All

Subsystem POWer:MIOutput:LIMit

The subsystem *POWer:MIOutput:LIMit* defines the tolerance values for the minimum output measurement. The subsystem corresponds to the *Minimum Power* section in the *Limits* tab of the *Power Configuration* popup menu.

Note: *The modulation scheme reference O-QPSK is optional in the commands to remain compatible with cdmaOne. O-QPSK supports radio configurations 1 and 2. H-PSK supports radio configurations 3 and 4.*

Minimum Output Limits
CONFigure:POWer:MIOutput[:OQPSk]:CAMMax:LIMit[:SCALar]:ASYMmetric[:COMBined]:VALue[?]
CONFigure:POWer:MIOutput:HPSK:CAMMax:LIMit[:SCALar]:ASYMmetric[:COMBined]:VALue[?]
<Absolute Min Power>, <Waveform Quality>

<Absolute Min Power>	Description of parameters	Def. value	Def. unit	
–128.0 dBm to 0.0 dBm,	Upper limit for absolute min. power	–50	dBm	
<Waveform Quality>	Description of parameters	Def. value	Def. unit	FW vers.
0.0 to 1.0	Lower limit for waveform quality	0.944	–	V3.05

Description of command	Sig. State
This commands defines the tolerance limits for the minimum output measurement. The limits apply to all measurement curves *(Current, Average, Minimum, Maximum)*.	All

DEFault:POWer:MIOutput[:OQPSk]:LIMit[?]
DEFault:POWer:MIOutput:HPSK:LIMit[?]
Limits Default Settings

<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | OFF	The parameters are set to their default values Some or all parameters are not set to default	ON	–	V3.05

Description of command	Sig. State
If used as a setting command with the parameter *ON*, this command sets all parameters of the subsystem POWer:MIOutput:LIMit to their default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.	All

Measured Values – Subsystem POWer:MIOutput

The subsystem *POWer:MIOutput* determines and outputs the results of the *Minimum Output* measurement. They correspond to the measurement menu *Power*, application *Minimum Output*, with its various display elements.

Note: *The modulation scheme reference O-QPSK is optional in the commands to remain compatible with cdmaOne. O-QPSK supports radio configurations 1 and 2. H-PSK supports radio configurations 3 and 4.*

Scalar results:

READ[:SCALar]:POWer:MIOutput[:OQPSk]?	Start single shot measurement and return results
FETCh[:SCALar]:POWer:MIOutput[:OQPSk]?	Read out measurement results (unsynchronized)
SAMPle[:SCALar]:POWer:MIOutput[:OQPSk]?	Read out measurement results (synchronized)
READ[:SCALar]:POWer:MIOutput:HPSK?	Start single shot measurement and return results
FETCh[:SCALar]:POWer:MIOutput:HPSK?	Read out measurement results (unsynchronized)
SAMPle[:SCALar]:POWer:MIOutput:HPSK?	Read out measurement results (synchronized)

Returned values	Value range	Def. value	Def. unit	FW vers.
Total Power Current,	–100.0 dBm to –50.0 dBm	NAN	dBm	V3.05
Total Power Average,	–100.0 dBm to –50.0 dBm	NAN	dBm	
Total Power Minimum,	–100.0 dBm to –50.0 dBm	NAN	dBm	
Total Power Maximum,	–100.0 dBm to –50.0 dBm	NAN	dBm	
Waveform Quality Current,	0.0 to 1.0	NAN	–	
Waveform Quality Average,	0.0 to 1.0	NAN	–	
Waveform Quality Minimum,	0.0 to 1.0	NAN	–	
Waveform Quality Maximum,	0.0 to 1.0	NAN	–	
Measurements out of Tolerance	0.0% to 100.0%	NAN	%	

Description of command	Sig. State
These commands are always queries. They start a measurement and output all scalar measurement results.	All

CALCulate[:SCALar]:POWer:MIOutput[:OQPSk]:MATChing:LIMit? **CALCulate[:SCALar]:POWer:MIOutput:HPSK:MATChing:LIMit?**				Limit Matching
Returned values	Value range	Def. value	Def. unit	FW vers.
Total Power Current,		INV	–	V3.05
Total Power Average,	For all values	INV	–	
Total Power Minimum,		INV	–	
Total Power Maximum,	NMAU | NMAL | INV | OK	INV	–	
Waveform Quality Current,		INV	–	
Waveform Quality Average,		INV	–	
Waveform Quality Minimum,		INV	–	
Waveform Quality Maximum		INV	–	

Description of command	Sig. State
This command is always a query. It indicates whether and in which way the (fixed) limit lines have been exceeded. The following messages may be generated: NMAU Tolerance value underflow *not matching, underflow* NMAL Tolerance value exceeded *not matching, overflow* INV Measurement invalid *invalid* OK Tolerance value matched	All

POWer:MAOutput

The subsystem *POWer:MAOutput* measures the MS maximum output power. The subsystem corresponds to the measurement menu *Power,* application *Maximum Output,* and the sections related to this application in the associated popup menu *Power Configuration.*

Control of measurement – Subsystem POWer:MAOutput

The subsystem *POWer:MAOutput* controls the maximum output measurement.

Note: *The modulation scheme reference O-QPSK is optional in the commands to remain compatible with cdmaOne. O-QPSK supports radio configurations 1 and 2. H-PSK supports radio configurations 3 and 4.*

INITiate:POWer:MAOutput[:OQPSk]	Start new measurement	⇒ *RUN*
ABORt:POWer:MAOutput[:OQPSk]	Abort running measurement and switch off	⇒ *OFF*
STOP:POWer:MAOutput[:OQPSk]	Stop measurement after current stat. cycle	⇒ *STOP*
CONTinue:POWer:MAOutput[:OQPSk]	Next measurement step (*stepping mode*)	⇒ *RUN*
INITiate:POWer:MAOutput:HPSK	Start new measurement	⇒ *RUN*
ABORt:POWer:MAOutput:HPSK	Abort running measurement and switch off	⇒ *OFF*
STOP:POWer:MAOutput:HPSK	Stop measurement after current stat. cycle	⇒ *STOP*
CONTinue:POWer:MAOutput:HPSK	Next measurement step (*stepping mode*)	⇒ *RUN*

Description of command	Sig. State	FW vers.
These commands have no query form. They start and stop the power measurement, setting it to the status indicated in the top right column.	All	V3.05

CONFigure:POWer:MAOutput[:OQPSk]:EREPorting[?] Event Reporting
CONFigure:POWer:MAOutput:HPSK:EREPorting[?]
<Report Mode>

<Report Mode>	Description of parameters	Def. value	Def. unit	FW vers.
SRQ | SOPC | SRSQ | OFF | DEFault	Service request Single operation complete SRQ and SOPC No reporting	OFF	–	V3.05

Description of command	Sig. State
This command defines the events generated when the measurement is terminated or stopped (see *Event Reporting* in Chapter 5 of the CMU manual).	All

FETCh[:SCALar]:POWer:MAOutput[:OQPSk]:STATus? Measurement Status
FETCh[:SCALar]:POWer:MAOutput:HPSK:STATus?

Return	Description of parameters	Def. value	Def. unit	FW vers.
OFF | RUN | STOP | ERR | STEP | RDY	Measurement in the OFF state (*RST or ABORt) Running (after INITiate, CONTinue or READ) Stopped (STOP) OFF (could not be started) Stepping mode (<stepmode>=STEP) Stopped according to repetition mode and stop condition	OFF	–	V3.05
1 to 10000 | NONE	Counter for current statistics cycle No counting mode set	NONE	–	
1 to 1000 NONE	Counter for current evaluation period within a cycle Statistic count set to off	NONE	–	

Description of command	Sig. State
This command is always a query. It returns the status of the measurement (see Chapters 3 and 5).	All

Subsystem POWer:MAOutput:CONTrol

The subsystem *POWer:MAOutput:CONTrol* defines the repetition mode, statistic count, and stop condition of the measurement. These settings are provided in the *Control* and *Statistics* tabs in the popup menu *Power Configuration.*

Note: *The modulation scheme reference O-QPSK is optional in the commands to remain compatible with cdmaOne. O-QPSK supports radio configurations 1 and 2. H-PSK supports radio configurations 3 and 4.*

CONFigure:POWer:MAOutput[:OQPSk]:CONTrol[?]
CONFigure:POWer:MAOutput:HPSK:CONTrol[?]
<Statistic Count>, <Repetition>, <Stop Cond>, <Step Mode>

Scope of Measurement

<Statistic Count>	Description of parameters	Def. value	Def. unit	
1 to 1000,	Number of bursts per statistics cycle	100	–	
<Repetition>	Description of parameters	Def. value	Def. unit	
1 to 10000	Multiple measurement (*counting*, until `Status = STEP | RDY`)	SING	–	
CONTinuous |	Continuous measurement (until `STOP` or `ABORT`)			
SINGleshot|	Single shot measurement (until `Status = RDY`)			
DEFault,				
<Stop Cond>	Description of parameters	Def. value	Def. unit	
NONE |	Continue measurement even in case of error	NONE	–	
SONerror |	Stop measurement in case of error *(stop on error)*			
DEFault,				
<Step Mode>	Description of parameters	Def. value	Def. unit	FW-Vers.
STEP |	Interrupt measurement after each statistics cycle	NONE	–	V3.05
NONE |	Continue measurement according to its rep. mode			
DEFault				
Description of command				Sig. State
This command combines the `...CONTrol:STATistics` and the `...CONTrol:REPetition` commands, see below.				All

CONFigure:POWer:MAOutput[:OQPSk]:CONTrol:STATistics[?]
CONFigure:POWer:MAOutput:HPSK:CONTrol:STATistics[?]
<Statistic Count >

Scope of Measurement

<Statistic Count>	Description of parameters	Def. value	Def. unit	FW-Vers.
1 to 1000	Number of bursts per statistics cycle	100	–	V3.05
Description of command				Sig. State
This command specifies the number of bursts forming a statistics cycle.				All

CONFigure:POWer:MAOutput[:OQPSk]:CONTrol:REPetition[?] Test Cycles
CONFigure:POWer:MAOutput:HPSK:CONTrol:REPetition[?]
<Repetition>, <Stop Cond>, <Step Mode>

<Repetition>	Description of parameters	Def. value	Def. unit	
1 to 10000	Multiple measurement (*counting*, until `Status = STEP | RDY`)	SING	–	
CONTinuous | SINGleshot | DEFault,	Continuous measurement (until `STOP` or `ABORT`) Single shot measurement (until `Status = RDY`)			
<Stop Cond>	Description of parameters	Def. value	Def. unit	
NONE | SONerror | DEFault,	Continue measurement even in case of error Stop measurement in case of error *(stop on error)*	NONE	–	
<Step Mode>	Description of parameters	Def. value	Def. unit	FW vers.
STEP | NONE | DEFault	Interrupt measurement after each statistics cycle Continue measurement according to its rep. mode	NONE	–	V3.05

Description of command	Sig. State
This command determines the repetition mode, stop condition, and stepping mode for the measurement. **Note:** *In the case of READ commands (`READ:...`), the <Repetition> parameter has no effect; the measurement is always stopped after a single shot.*	All

Test Configuration

The subsystem *POWer:MAOutput:ENVironment...* configures the generated RF signal. It corresponds to the *Measurement Environment* section in the *Control* tab of the *Power Configuration* menu. The settings are used only if the environment is enabled; see `CONFigure:POWer:MAOutput:ENVironment:ENABle`.

Note: *The modulation scheme reference O-QPSK is optional in the commands to remain compatible with cdmaOne. O-QPSK supports radio configurations 1 and 2. H-PSK supports radio configurations 3 and 4.*

CONFigure:POWer:MAOutput[:OQPSk]:ENVironment:ENABle[?] Environment Enable
CONFigure:POWer:MAOutput:HPSK:ENVironment:ENABle[?]
<Enable>

<Enable>	Description of parameters	Def. Value	Def. Unit	FW vers.
ON | OFF	Enable or disable environment	ON	–	V3.20

Description of command	Sig. State
These commands enable or disable the environment for the *Max. Power* measurement applications.	All

CONFigure:POWer:MAOutput[:OQPSk]:ENVironment:POWer:CDMA[?] CDMA Power
CONFigure:POWer:MAOutput:HPSK:ENVironment:POWer:CDMA[?]
<CDMA Power>

<CDMA Power>	Description of parameters	Def. value	Def. unit	FW vers.
–120.0 dBm to –33.0 dBm |	RF1 OUT, 0 dB ext. atten	–104.0	dBm	V3.20
–120.0 dBm to –16.0 dBm |	RF2 OUT, 0 dB ext. atten			
–100.0 dBm to +7.0 dBm |	RF3 OUT, 0 dB ext. atten			
DEFault |	Sets the value to the default setting			
MINimum |	Sets the value to the range minimum			
MAXimum	Sets the value to the range maximum			

Description of command	Sig. State
These commands determine the total CDMA output power (absolute value, in dBm) of the CMU. The CDMA Power value range depends on the RF input used and the external attenuation set.	All

CONFigure:POWer:MAOutput[:OQPSk]:ENVironment:LEVel:FPICh[?] F-PICH Level
CONFigure:POWer:MAOutput:HPSK:ENVironment:LEVel:FPICh[?]
<Pilot Level>

<Pilot Level>	Description of parameters	Def. value	Def. unit	FW vers.
–20.0 dB to –7.0 dB |	Pilot Level	–7.0	dB	V3.20
OFF	F-PICH switched off			

Description of command	Sig. State
These commands determine the level in the forward pilot channel of the CMU. The channel power is in units relative to the total CDMA power.	All

CONFigure:POWer:MAOutput[:OQPSk]:ENVironment:LEVel:FFCH[?] F-FCH Level
CONFigure:POWer:MAOutput:HPSK:ENVironment:LEVel:FFCH[?]
<FCH Level>

<FCH Level>	Description of parameters	Def. value	Def. unit	FW vers.
–20.0 dB to –7.0 dB |	FCH Level	–7.4	dB	V3.20
OFF	F-FCH switched off			

Description of command	Sig. State
These commands determines the level in the forward fundamental channel of the CMU. The channel power is in units relative to the total CDMA power.	All

CONFigure:POWer:MAOutput[:OQPSk]:ENVironment:LEVel:FSCH:ZERO[?] F-SCH0 Level
CONFigure:POWer:MAOutput:HPSK:ENVironment:LEVel:FSCH:ZERO[?]
<SCH0 Level>

<SCH0 Level>	Description of parameters	Def. value	Def. unit	FW vers.
–20.0 dB to –7.0 dB |	F-SCH0 Level	OFF	dB	V3.20
OFF	F-SCH0 switched off			

Description of command	Sig. State
These commands determine the level in the forward SCH0 channel of the CMU. The channel power is in units relative to the total CDMA power.	All

CONFigure:POWer:MAOutput[:OQPSk]:ENVironment:LEVel:FSCH:ONE[?] **CONFigure:POWer:MAOutput:HPSK:ENVironment:LEVel:FSCH:ONE[?]** ***<SCH1 Level>***				F-SCH1 Level
<SCH1 Level>	Description of parameters	Def. value	Def. unit	FW vers.
–20.0 dB to –7.0 dB | OFF	F-SCH1 Level F-SCH1 switched off	OFF	dB	V3.20
Description of command				Sig. State
These commands determine the level in the forward SCH1 channel of the CMU. The channel power is in units relative to the total CDMA power.				All

CONFigure:POWer:MAOutput[:OQPSk]:ENVironment:EBNT:FFCH? **CONFigure:POWer:MAOutput:HPSK:ENVironment:EBNT:FFCH?** ***<Eb/Nt>***				F-FCH Eb/Nt
<Eb/Nt>	Description of parameters	Def. value	Def. unit	FW vers.
–30.969 dB to 18.072 dB	Calculated F-FCH Eb/Nt	–	dB	V3.20
Description of command				Sig. State
These commands are always queries. They return the calculated signal to noise ratio for the forward FCH. This quantity is undefined unless the AWGN generator is turned on (`CONFigure:POWer:MAOutput[:OQPSk]:ENVironment:IMPairments:LEVel:AWGN`). The quoted range of values is valid for data rates between 9.6 kbps and 153.6 kbps; see *Eb/Nt Calculation* in Chapter 4.				All

CONFigure:POWer:MAOutput:HPSK:ENVironment:EBNT:FSCH:ZERO? **CONFigure:POWer:MAOutput[:OQPSk]:ENVironment:EBNT:FSCH:ZERO?** ***<Eb/Nt>***				F-SCH0 Eb/Nt
<Eb/Nt>	Description of parameters	Def. value	Def. unit	FW vers.
–30.969 dB to 18.072 dB	Calculated F-SCH0 Eb/Nt	–	dB	V3.20
Description of command				Sig. State
These commands are always queries. They return the calculated signal to noise ratio for the forward SCH0. This quantity is undefined unless the AWGN generator is turned on (`CONFigure:POWer:MAOutput:HPSK:ENVironment:IMPairments:LEVel:AWGN`). The quoted range of values is valid for data rates between 9.6 kbps and 153.6 kbps; see *Eb/Nt Calculation* in Chapter 4.				All

CONFigure:POWer:MAOutput[:OQPSk]:ENVironment:EBNT:FSCH:ONE? **CONFigure:POWer:MAOutput:HPSK:ENVironment:EBNT:FSCH:ONE?** ***<Eb/Nt>***				F-SCH1 Eb/Nt
<Eb/Nt>	Description of parameters	Def. value	Def. unit	FW vers.
–30.969 dB to 18.072 dB	Calculated F-SCH1 Eb/Nt	–	dB	V3.20
Description of command				Sig. State
These commands are always queries. They return the calculated signal to noise ratio for the forward SCH1. This quantity is undefined unless the AWGN generator is turned on (`CONFigure:POWer:MAOutput[:OQPSk]:ENVironment:IMPairments:LEVel:AWGN`). The quoted range of values is valid for data rates between 9.6 kbps and 153.6 kbps; see *Eb/Nt Calculation* in Chapter 4.				All

CONFigure:POWer:MAOutput[:OQPSk]:ENVironment:FRATe:FFCH[?] Frame Rate
CONFigure:POWer:MAOutput:HPSK:ENVironment:FRATe:FFCH[?]
<Frame Rate>

<Frame Rate>	Description of parameters	Def. value	Def. unit	FW vers.
EIGHth |	Frames at 1/8 of the rate set	FULL	–	V3.20
QUARter |	Frames at 1/4 of the rate set			
HALF |	Frames at 1/2 of the rate set			
FULL |	Frames at the full rate set			
DEFault				

Description of command	Sig. State
These commands set the frame rate for the variable rate traffic channel.	All

CONFigure:POWer:MAOutput[:OQPSk]:ENVironment:IMPairments:AWGN[?] AWGN Level
CONFigure:POWer:MAOutput:HPSK:ENVironment:IMPairments:AWGN[?]
<AWGN Level>

<AWGN Level>	Description of parameters	Def. value	Def. unit	FW vers.
–20.0 dB to +4.0 dB |	AWGN level	OFF	dB	V3.20
DEFault |	Sets the value to the default setting			
MINimum |	Sets the value to the range minimum			
MAXimum |	Sets the value to the range maximum			
OFF,				

Description of command	Sig. State
These commands determine an Additional White Gaussian Noise level to impair the CMU output signal.	All

CONFigure:POWer:MAOutput[:OQPSk]:ENVironment:IMPairments:FOFFset[?] BS Frequency Offset
CONFigure:POWer:MAOutput:HPSK:ENVironment:IMPairments:FOFFset[?]
<BS Freq Offset>

<BS Freq Offset>	Description of parameters	Def. value	Def. unit	FW vers.
–50.0 kHz to +50.0 kHz |	BS frequency offset	OFF	Hz	V3.20
DEFault |	Sets the value to the default setting			
MINimum |	Sets the value to the range minimum			
MAXimum |	Sets the value to the range maximum			
OFF				

Description of command	Sig. State
These commands determine a frequency offset to impair the CMU output signal.	All

CONFigure:POWer:MAOutput[:OQPSk]:ENVironment:IMPairments:ITFer[?]
CONFigure:POWer:MAOutput:HPSK:ENVironment:IMPairments:ITFer[?]
<FER>

Injected Tx FER

<FER>	Description of parameters	Def. value	Def. unit	FW vers.
0% to 50% | OFF | ON	Injected Tx FER Switch FER injection off (equiv. to 0%) Re-activate FER injection, using the previously defined value	OFF	–	V3.20
Description of command				Sig. State
These commands define a percentage of faulty (i.e. erasure) frames that the CMU injects into all traffic channels of its BS Signal.				All

CONFigure:POWer:MAOutput[:OQPSk]:ENVironment:PCBits?
CONFigure:POWer:MAOutput:HPSK:ENVironment:PCBits?
<Power Control Bits>

Power Control Bits

Response	Description of parameters	Def. value	Def. unit	FW vers.
AUP	All power control bits up	–	–	V3.20
Description of command				Sig. State
These commands are always queries. They return the fixed Power Control Bit sequence of the *Max. Power* application.				All

Subsystem POWer:MAOutput:LIMit

The subsystem *POWer:MAOutput:LIMit* defines the tolerance values for the maximum output measurement. The subsystem corresponds to the *Maximum Output* section in the *Limits* tab of the *Power Configuration* popup menu.

Note: *The modulation scheme reference O-QPSK is optional in the commands to remain compatible with cdmaOne. O-QPSK supports radio configurations 1 and 2. H-PSK supports radio configurations 3 and 4.*

Output Limits

CONFigure:POWer:MAOutput[:OQPSk]:CAMMax:LIMit[:SCALar]:ASYMmetric[:COMBined]:VALue[?]
CONFigure:POWer:MAOutput:HPSK:CAMMax:LIMit[:SCALar]:ASYMmetric[:COMBined]:VALue[?]
<Absolute Max Power>, <Upper Limit>, <Lower Limit>, <Waveform Quality>

<Absolute Max Power>	Description of parameters	Def. value	Def. unit	
0.0 dBm to +128.0 dBm,	Absolute maximum power	23.0	dBm	
<Upper Limit>	Description of parameters	Def. value	Def. unit	
–128.0 dBm to +128.0 dBm,	Upper limit for maximum power	7.0	dB	
<Lower Limit>	Description of parameters	Def. value	Def. unit	
–128.0 dBm to +128.0 dBm,	Lower limit for maximum power	0.0	dBm	
<Waveform Quality>	Description of parameters	Def. value	Def. unit	FW vers.
0.0 to 1.0	Lower limit for waveform quality	0.944	–	V3.05
Description of command				Sig. State
This commands defines the tolerance limits for the maximum output measurement. The limits apply to all measurement curves *(Current, Average, Minimum, Maximum)*.				All

DEFault:POWer:MAOutput[:OQPSk]:LIMit[?] **DEFault:POWer:MAOutput:HPSK:LIMit[?]** **<*Enable*>**				Default Settings
<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | OFF	the parameters are set to their default values Some or all parameters are not set to default	ON	–	V3.05
Description of command				Sig. State
If used as a setting command with the parameter *ON*, this command sets all parameters of the subsystem POWer:MAOutput:LIMit to their default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.				All

Measured Values – Subsystem POWer

The subsystem *POWer:MAOutput* determines and outputs the results of the *Maximum Output* measurement. They correspond to the measurement menu *Power*, application *Maximum Output,* with its various display elements.

Note: *The modulation scheme reference O-QPSK is optional in the commands to remain compatible with cdmaOne. O-QPSK supports radio configurations 1 and 2. H-PSK supports radio configurations 3 and 4.*

READ[:SCALar]:POWer:MAOutput[:OQPSk]? **FETCh[:SCALar]:POWer:MAOutput[:OQPSk]?** **SAMPle[:SCALar]:POWer:MAOutput[:OQPSk]?** **READ[:SCALar]:POWer:MAOutput:HPSK?** **FETCh[:SCALar]:POWer:MAOutput:HPSK?** **SAMPle[:SCALar]:POWer:MAOutput:HPSK?**	Scalar results: Start single shot measurement and return results Read out measurement results (unsynchronized) Read out measurement results (synchronized) Start single shot measurement and return results Read out measurement results (unsynchronized) Read out measurement results (synchronized)			
Returned values	Value range	Def. value	Def. unit	FW vers.
Total Power Current,	–100.0 dBm to –50.0 dBm	NAN	dBm	V3.05
Total Power Average,	–100.0 dBm to –50.0 dBm	NAN	dBm	
Total Power Minimum,	–100.0 dBm to –50.0 dBm	NAN	dBm	
Total Power Maximum,	–100.0 dBm to –50.0 dBm	NAN	dBm	
Waveform Quality Current,	0.0 to 1.0	NAN	–	
Waveform Quality Average,	0.0 to 1.0	NAN	–	
Waveform Quality Minimum,	0.0 to 1.0	NAN	–	
Waveform Quality Maximum,	0.0 to 1.0	NAN	–	
Meas. out of Tolerance	0.0% to 100.0%	NAN	%	
Description of command				Sig. State
These commands are always queries. They start a measurement and output all scalar measurement results.				All

<table>
<tr><td colspan="4">CALCulate[:SCALar]:POWer:MAOutput[:OQPSk]:MATChing:LIMit?
CALCulate[:SCALar]:POWer:MAOutput:HPSK:MATChing:LIMit?</td><td>Limit Matching</td></tr>
<tr><td>Returned values</td><td>Value range</td><td>Def. value</td><td>Def. unit</td><td>FW vers.</td></tr>
<tr><td>Total Power Current,</td><td></td><td>INV</td><td>–</td><td>V3.05</td></tr>
<tr><td>Total Power Average,</td><td>For all values</td><td>INV</td><td>–</td><td></td></tr>
<tr><td>Total Power Minimum,</td><td></td><td>INV</td><td>–</td><td></td></tr>
<tr><td>Total Power Maximum,</td><td>NMAU | NMAL | INV | OK</td><td>INV</td><td>–</td><td></td></tr>
<tr><td>Waveform Quality Current,</td><td></td><td>INV</td><td>–</td><td></td></tr>
<tr><td>Waveform Quality Average,</td><td></td><td>INV</td><td>–</td><td></td></tr>
<tr><td>Waveform Quality Minimum,</td><td></td><td>INV</td><td>–</td><td></td></tr>
<tr><td>Waveform Quality Maximum</td><td></td><td>INV</td><td>–</td><td></td></tr>
<tr><td colspan="4">Description of command</td><td>Sig. State</td></tr>
<tr><td colspan="4">This command is always a query. It indicates whether and in which way the (fixed) limit lines have been exceeded. The following messages may be generated:
NMAU Tolerance value underflow <i>not matching, underflow</i>
NMAL Tolerance value exceeded <i>not matching, overflow</i>
INV Measurement invalid <i>invalid</i>
OK Tolerance value matched</td><td>All</td></tr>
</table>

POWer:GOUTput

The subsystem *POWer:GOUTput* measures the MS gated output power. The subsystem corresponds to the measurement menu *Power,* application *Gated Output,* and the sections related to this application in the associated popup menu *Power Configuration.*

Note: *To ensure that the mobile station's output signal is gated, establish a connection with Reverse Radio Configuration 1 or 2.*

Control of measurement – Subsystem POWer:GOUTput

The subsystem *POWer:GOUTput* controls the gated output measurement.

INITiate:POWer:GOUTput	Start new measurement	⇒ *RUN*
ABORt:POWer:GOUTput	Abort running measurement and switch off	⇒ *OFF*
STOP:POWer:GOUTput	Stop measurement after current stat. cycle	⇒ *STOP*
CONTinue:POWer:GOUTput	Next measurement step (*stepping mode*)	⇒ *RUN*
Description of command		FW vers.
These commands have no query form. They start and stop the power measurement, setting it to the status indicated in the top right column.		V3.05

CONFigure:POWer:GOUTput:EREPorting[?] Event Reporting
<*Report Mode*>

<Report Mode>	Description of parameters	Def. value	Def. unit	FW vers.
SRQ |	Service request	OFF	–	V3.05
SOPC |	Single operation complete			
SRSQ |	SRQ and SOPC			
OFF |	No reporting			
DEFault	Sets the value to the default setting			

Description of command	Sig. State
This command defines the events generated when the measurement is terminated or stopped (see *Event Reporting* in Chapter 5 of the CMU manual).	All

FETCh[:SCALar]:POWer:GOUTput:STATus? Measurement Status

Return	Description of parameters	Def. value	Def. unit	FW vers.
OFF |	Measurement in the OFF state (*RST or ABORt)	OFF	–	V3.05
RUN |	Running (after INITiate, CONTinue or READ)			
STOP |	Stopped (STOP)			
ERR |	OFF (could not be started)			
STEP |	Stepping mode (<stepmode>=STEP)			
RDY	Stopped according to repetition mode and stop condition			
1 to 10000 |	Counter for current statistics cycle	NONE	–	
NONE	No counting mode set			
1 to 1000	Counter for current evaluation period within a cycle	NONE	–	
NONE	Statistic count set to off			

Description of command	Sig. State
This command is always a query. It returns the status of the measurement (see Chapters 3 and 5).	All

Subsystem POWer:GOUTput:CONTrol

The subsystem *POWer:GOUTput:CONTrol* defines the repetition mode, statistic count, and stop condition of the measurement. These settings are provided in the *Control* tab in the popup menu *Power Configuration.*

CONFigure:POWer:GOUTput:CONTrol[?] Scope of Measurement
<Result Mode>, <Statistic Count>, <Repetition>, <Stop Cond>, <Step Mode>

<Result Mode>	Description of parameters	Def. value	Def. unit	
SCALar | ARRay,	Scalar values only (incl. ramp matching) Scalar measured values and arrays	ARR	–	
<Statistic Count>	Description of parameters	Def. value	Def. unit	
1 to 1000,	Number of bursts per statistics cycle	100	–	
<Repetition>	Description of parameters	Def. value	Def. unit	
1 to 10000 | CONTinuous | SINGleshot | DEFault,	Multiple measurement (counting, until Status = STEP | RDY) Continuous measurement (until STOP or ABORT) Single shot measurement (until Status = RDY) Sets the value to the default setting	SING	–	
<Stop Cond>	Description of parameters	Def. value	Def. unit	
NONE | SONerror | DEFault,	Continue measurement even in case of error Stop measurement in case of error *(stop on error)* Sets the value to the default setting	NONE	–	
<Step Mode>	Description of parameters	Def. value	Def. unit	FW-Vers.
STEP | NONE | DEFault	Interrupt measurement after each statistics cycle Continue measurement according to its rep. Mode Sets the value to the default setting	NONE	–	V3.05
Description of command				Sig. State
This command combines the ...CONTrol:RMODe, ...CONTrol:STATistics and ...CONTrol:REPetition commands, see below.				All

CONFigure:POWer:GOUTput:CONTrol:RMODe[?] Result Mode
<Result Mode>

<Result Mode>	Description of parameters	Def. value	Def. unit	FW-Vers.
SCALar | ARRay	Scalar values only (incl. ramp matching) Scalar measured values and arrays	ARR	–	V3.05
Description of command				Sig. State
This command specifies the type of measured values.				All

CONFigure:POWer:GOUTput:CONTrol:STATistics[?] Statistic Count
<Statistics>

<Statistics>	Description of parameters	Def. value	Def. unit	FW-Vers.
1 to 1000	Number of bursts per statistics cycle	100	–	V3.05
Description of command				
This command specifies the number of bursts forming a statistics cycle.				All

CONFigure:POWer:GOUTput:CONTrol:REPetition[?] Test Cycles
<Repetition>, <Stop Cond>, <Step Mode>

<Repetition>	Description of parameters	Def. value	Def. unit	
1 to 10000 |	Multiple measurement (counting, until Status = STEP | RDY)	SING	–	
CONTinuous |	Continuous measurement (until STOP or ABORT)			
SINGleshot |	Single shot measurement (until Status = RDY)			
DEFault,	Sets the value to the default setting			
<Stop Cond>	Description of parameters	Def. value	Def. unit	
NONE |	Continue measurement even in case of error	NONE	–	
SONerror |	Stop measurement in case of error *(stop on error)*			
DEFault,	Sets the value to the default setting			
<Step Mode>	Description of parameters	Def. value	Def. unit	FW vers.
STEP |	Interrupt measurement after each statistics cycle	NONE	–	V3.05
NONE |	Continue measurement according to its rep. Mode			
DEFault	Sets the value to the default setting			

Description of command	Sig. State
This command determines the repetition mode, stop condition, and stepping mode for the measurement. **Note:** *In the case of READ commands (`READ:...`), the <Repetition> parameter has no effect; the measurement is always stopped after a single shot.*	All

CONFigure:POWer:GOUTput:CONTrol:PCGcount[?] Power Control Groups
<PCG Count>

<PCG Count>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 200	Power Control Groups	100	–	V3.05

Description of command	Sig. State
This command determines how many power control groups are used for a single trace in the Gated Output measurement.	All

DEFault:POWer:GOUTput:LIMit[?] Default Settings
<Enable>

Enable	Description of parameters	Def. value	Def. unit	FW vers.
ON |	The parameters are set to their default values	ON	–	V3.05
OFF	Some or all parameters are not set to default			

Description of command	Sig. State
If used as a setting command with the parameter *ON,* this command sets all parameters of the subsystem POWer:GOUTput:Limt to their default values (the setting OFF results in an error message). If used as a query, the command returns whether all parameters are set to their default values *(ON)* or not *(OFF).*	All

Test Configuration

The subsystem *POWer:GOUTput:ENVironment…* configures the generated RF signal. It corresponds to the *Measurement Environment* section in the *Control* tab of the *Power Configuration* menu. The settings are used only if the environment is enabled; see `CONFigure:POWer:GOUTput:ENVironment:ENABle`.

CONFigure:POWer:GOUTput:ENVironment:ENABle[?] Environment Enable
<Enable>

<Enable>	Description of parameters	Def. Value	Def. Unit	FW vers.
ON | OFF	Enable or disable environment	ON	–	V3.20
Description of command				Sig. State
This command enables or disables the environment for the *Gated Output* power application.				All

CONFigure:POWer:GOUTput:ENVironment:POWer:CDMA[?] CDMA Power
<CDMA Power>

<CDMA Power>	Description of parameters	Def. value	Def. unit	FW vers.
–120.0 dBm to –33.0 dBm | –120.0 dBm to –16.0 dBm | –100.0 dBm to +7.0 dBm | DEFault | MINimum | MAXimum	RF1 OUT, 0 dB ext. atten RF2 OUT, 0 dB ext. atten RF3 OUT, 0 dB ext. atten Sets the value to the default setting Sets the value to the range minimum Sets the value to the range maximum	–50.0	dBm	V3.20
Description of command				Sig. State
This command determines the total CDMA output power (absolute value, in dBm) of the CMU. The CDMA Power value range depends on the RF input used and the external attenuation set.				All

CONFigure:POWer:GOUTput:ENVironment:LEVel:FPICh[?] F-PICH Level
<Pilot Level>

<Pilot Level>	Description of parameters	Def. value	Def. unit	FW vers.
–20.0 dB to –7.0 dB | OFF	Pilot Level F-PICH switched off	–7.0	dB	V3.20
Description of command				Sig. State
This command determines the level in the forward pilot channel of the CMU. The channel power is in units relative to the total CDMA power.				All

CONFigure:POWer:GOUTput:ENVironment:LEVel:FFCH[?] F-FCH Level
<FCH Level>

<FCH Level>	Description of parameters	Def. value	Def. unit	FW vers.
–20.0 dB to –7.0 dB | OFF	FCH Level F-FCH switched off	–7.4	dB	V3.20
Description of command				Sig. State
This command determines the level in the forward fundamental channel of the CMU. The channel power is in units relative to the total CDMA power.				All

CONFigure:POWer:GOUTput:ENVironment:LEVel:FSCH:ZERO[?] F-SCH0 Level
<SCH0 Level>

<SCH0 Level>	Description of parameters	Def. value	Def. unit	FW vers.
–20.0 dB to –7.0 dB | OFF	F-SCH0 Level F-SCH0 switched off	OFF	dB	V3.20

Description of command	Sig. State
This command determines the level in the forward SCH0 channel of the CMU. The channel power is in units relative to the total CDMA power.	All

CONFigure:POWer:GOUTput:ENVironment:LEVel:FSCH:ONE[?] F-SCH1 Level
<SCH1 Level>

<SCH1 Level>	Description of parameters	Def. value	Def. unit	FW vers.
–20.0 dB to –7.0 dB | OFF	F-SCH1 Level F-SCH1 switched off	OFF	dB	V3.20

Description of command	Sig. State
This command determines the level in the forward SCH1 channel of the CMU. The channel power is in units relative to the total CDMA power.	All

CONFigure:POWer:GOUTput:ENVironment:EBNT:FFCH? F-FCH Eb/Nt
<Eb/Nt>

<Eb/Nt>	Description of parameters	Def. value	Def. unit	FW vers.
–30.969 dB to 18.072 dB	Calculated F-FCH Eb/Nt	–	dB	V3.20

Description of command	Sig. State
This command is always a query. It returns the calculated signal to noise ratio for the forward FCH. This quantity is undefined unless the AWGN generator is turned on (`CONFigure:POWer:GOUTput:ENVironment:IMPairments:LEVel:AWGN`). The quoted range of values is valid for data rates between 9.6 kbps and 153.6 kbps; see *Eb/Nt Calculation* in Chapter 4.	All

CONFigure:POWer:GOUTput:ENVironment:EBNT:FSCH:ZERO? F-SCH0 Eb/Nt
<Eb/Nt>

<Eb/Nt>	Description of parameters	Def. value	Def. unit	FW vers.
–30.969 dB to 18.072 dB	Calculated F-SCH0 Eb/Nt	–	dB	V3.20

Description of command	Sig. State
This command is always a query. It returns the calculated signal to noise ratio for the forward SCH0. This quantity is undefined unless the AWGN generator is turned on (`CONFigure:POWer:GOUTput:ENVironment:IMPairments:LEVel:AWGN`). The quoted range of values is valid for data rates between 9.6 kbps and 153.6 kbps; see *Eb/Nt Calculation* in Chapter 4.	All

CONFigure:POWer:GOUTput:ENVironment:EBNT:FSCH:ONE? F-SCH1 Eb/Nt
<Eb/Nt>

<Eb/Nt>	Description of parameters	Def. value	Def. unit	FW vers.
–30.969 dB to 18.072 dB	Calculated F-SCH1 Eb/Nt	–	dB	V3.20

Description of command	Sig. State
This command is always a query. It returns the calculated signal to noise ratio for the forward SCH1. This quantity is undefined unless the AWGN generator is turned on (`CONFigure:POWer:GOUTput:ENVironment:IMPairments:LEVel:AWGN`). The quoted range of values is valid for data rates between 9.6 kbps and 153.6 kbps; see *Eb/Nt Calculation* in Chapter 4.	All

CONFigure:POWer:GOUTput:ENVironment:FRATe:FFCH[?] Frame Rate
<Frame Rate>

<Frame Rate>	Description of parameters	Def. value	Def. unit	FW vers.
EIGHth | QUARter | HALF | FULL | DEFault	Frames at 1/8 of the rate set Frames at 1/4 of the rate set Frames at 1/2 of the rate set Frames at the full rate set	FULL	–	V3.20
Description of command				Sig. State
This command sets the frame rate for the variable rate traffic channel.				All

CONFigure:POWer:GOUTput:ENVironment:IMPairments:AWGN[?] AWGN Level
<AWGN Level>

<AWGN Level>	Description of parameters	Def. value	Def. unit	FW vers.
–20.0 dB to +4.0 dB | DEFault | MINimum | MAXimum | OFF,	AWGN level Sets the value to the default setting Sets the value to the range minimum Sets the value to the range maximum	OFF	dB	V3.20
Description of command				Sig. State
This command determines an Additional White Gaussian Noise level to impair the CMU output signal.				All

CONFigure:POWer:GOUTput:ENVironment:IMPairments:FOFFset[?] BS Frequency Offset
<BS Freq Offset>

<BS Freq Offset>	Description of parameters	Def. value	Def. unit	FW vers.
–50.0 kHz to +50.0 kHz | DEFault | MINimum | MAXimum | OFF	BS frequency offset Sets the value to the default setting Sets the value to the range minimum Sets the value to the range maximum	OFF	Hz	V3.20
Description of command				Sig. State
This command determines a frequency offset to impair the CMU output signal.				All

CONFigure:POWer:GOUTput:ENVironment:IMPairments:ITFer[?] *<FER>*				Injected Tx FER
<FER>	Description of parameters	Def. value	Def. unit	FW vers.
0% to 50% | OFF | ON	Injected Tx FER Switch FER injection off (equiv. to 0%) Re-activate FER injection, using the previously defined value	OFF	–	V3.20
Description of command				Sig. State
This command defines a percentage of faulty (i.e. erasure) frames that the CMU injects into all traffic channels of its BS Signal.				All

CONFigure:POWer:GOUTput:ENVironment:PCBits?				Power Control Bits
Response	Description of parameters	Def. value	Def. unit	FW vers.
AUT	Auto mode, closed-loop operation	AUT	–	V3.20
Description of command				Sig. State
This command is always a query and returns the power control bit sequence that the CMU sends to the mobile station to control its output power.				All

Subsystem POWer:GOUTput:LIMit

The subsystem *POWer:GOUTput:LIMit* defines the tolerance values for the gated output measurement. The subsystem corresponds to the *Limits* tab of the *Power Configuration* popup menu.

DEFault:POWer:GOUTput:LIMit[?]				Limits Default Settings
<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | OFF	The parameters are set to their default values Some or all parameters are not set to default	ON	–	V3.05
Description of command				Sig. State
If used as a setting command with the parameter *ON,* this command sets all parameters of the subsystem POWer:GOUTput:LIMit to their default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF).*				All

CONFigure:POWer:GOUTput:CAMMax:LIMit:A:VALue[?] <A Limit>				A Limit (Rise Time)
<A Limit>	Description of parameters	Def. value	Def. unit	FW vers.
1 µs to 10 µs | DEFault | MINimum | MAXimum | OFF	Maximum rise time Default value Sets the value to the range minimum Sets the value to the range maximum No offset	7E-06	s	V3.08
Description of command				Sig. State
This command sets the maximum rise time of the gated output power.				All

CONFigure:POWer:GOUTput:CAMMax:LIMit:B:VALue[?] B Limit (Fall Time)
<B Limit>

<B Limit>	Description of parameters	Def. value	Def. unit	FW vers.
1 µs to 10 µs |	Maximum fall time	7E-06	s	V3.08
DEFault |	Default value			
MINimum |	Sets the value to the range minimum			
MAXimum |	Sets the value to the range maximum			
OFF	No offset			

Description of command	Sig. State
This command sets the maximum fall time of the gated output power.	All

CONFigure:POWer:GOUTput:CAMMax:LIMit:BREFerence:VALue[?] B Limit (Reference Time)
<B Limit_Ref>

<B Limit_Ref>	Description of parameters	Def. value	Def. unit	FW vers.
1240 µs to 1266 µs |	B reference time	1.247E–3	s	V3.08
DEFault |	Default value			
MINimum |	Sets the value to the range minimum			
MAXimum |	Sets the value to the range maximum			
OFF	No offset			

Description of command	Sig. State
This command sets an offset time for the right limit reference line and the right part of the power template relative to the upper end of the lower part of the power template. This parameter must be larger than the sum of the *E Limit (Reference Time)* and the gated-on time *E Limit (Gated On)*; see below. The maximum B reference time is equal to the sum of the following three values: *max(B Limit (Ref. Time)) = max(E Limit (Gated On)) + max(E Limit (Ref. Time)) + min(B Limit (Fall Time))*	All

CONFigure:POWer:GOUTput:CAMMax:LIMit:C:VALue[?] C Limit
<C Limit>

<C Limit>	Description of parameters	Def. value	Def. unit	FW vers.
–20 dB to –1 dB |	Gated-on power	–3	dB	V3.08
DEFault |	Default value			
MINimum |	Sets the value to the range minimum			
MAXimum |	Sets the value to the range maximum			
OFF	No offset			

Description of command	Sig. State
This command sets the minimum level of the gated-on power relative to the mean output power.	All

CONFigure:POWer:GOUTput:CAMMax:LIMit:D:RELative:VALue[?] C Limit (relative)
<D Limit_Rel>

<D Limit_Rel>	Description of parameters	Def. value	Def. unit	FW vers.
–25 dB to 0 dB |	Gated-off power (relative)	–20	dB	V3.08
DEFault |	Default value			
MINimum |	Sets the value to the range minimum			
MAXimum |	Sets the value to the range maximum			
OFF	No offset			

Description of command	Sig. State
This command sets the maximum level of the gated-off power relative to the mean output power.	All

CONFigure:POWer:GOUTput:CAMMax:LIMit:D:ABS:VALue[?] C Limit (absolute)
<D Limit_Abs>

<D Limit_Abs>	Description of parameters	Def. value	Def. unit	FW vers.
–70 dBm to 0 dBm |	Gated-off power (absolute)	–54	dBm	V3.08
DEFault |	Default value			
MINimum |	Sets the value to the range minimum			
MAXimum |	Sets the value to the range maximum			
OFF	No offset			

Description of command	Sig. State
This command sets the absolute maximum level of the gated-off power.	All

CONFigure:POWer:GOUTput:CAMMax:LIMit:E:VALue[?] E Limit (Gated On)
<E Limit>

<E Limit>	Description of parameters	Def. value	Def. unit	FW vers.
1240 µs to 1260 µs |	Gated-on time	1.247E–3	s	V3.08
DEFault |	Default value			
MINimum |	Sets the value to the range minimum			
MAXimum |	Sets the value to the range maximum			
OFF	No offset			

Description of command	Sig. State
This command sets the minimum gated-on time. Increasing this parameter also increases *B Limit (Reference Time)* so that: *B Limit (Reference Time) ≥ E Limit (Reference Time) + E Limit (Gated On).*	All

CONFigure:POWer:GOUTput:CAMMax:LIMit:EREFerence:VALue[?] E Limit (Reference Time)
<E Limit_Ref>

<E Limit_Ref>	Description of parameters	Def. value	Def. unit	FW vers.
0 µs to 5 µs |	E reference time	0	s	V3.08
DEFault |	Default value			
MINimum |	Sets the value to the range minimum			
MAXimum |	Sets the value to the range maximum			
OFF	No offset			

Description of command	Sig. State
This command sets an offset time for the lower and right part of the power template relative to the 0-µs time reference of the x-axis and the measurement curve. Increasing this parameter also increases *B Limit (Reference Time)* so that: *B Limit (Ref. Time) ≥ E Limit (Ref. Time) + E Limit (Gated On).*	All

Subsystem SUBarrays:POWer:GOUTput

The subsystem *SUBarrays:POWer:GOUTput* defines the measurement range and the type of output values.

CONFigure:SUBarrays:POWer:GOUTput[?] Definition of Subarrays
<Mode>, <Start>, <Samples>

<Mode>	Description of parameters	Def. value	Def. unit	
ALL | ARIThmetical | MINimum | MAXimum,	Return all measurement values Return arithm. mean value in every range Return minimum value in every range Return maximum value in every range	ALL	–	
<Start>	Description of parameters	Def. value	Def. unit	
–0.0001 s to 0.0014 s,	Start time in current range	NAN	s	
<Samples>	Description of parameters	Def. value	Def. unit	FW vers.
0 to 1664	Number of samples in range	NAN	–	V3.05
Description of command				Sig. State
This command configures the `READ:SUBarrays:POWer:GOUTput...`, `FETCh:SUBarrays:POWer:GOUTput...`, `SAMPle:SUBarrays:POWer:GOUTput...` commands. It restricts the measurement to up to 32 subranges where either all measurement results (the number of which is given by the second numerical parameter) or a single statistical value is returned. The subranges are defined by a start time and the number of test points which are located on a fixed, equidistant grid. The subranges may overlap but must be within the total range of the *POWer:GOUTput* measurement. Test points outside this range are not measured (result *NAN)* and do not enter into the ARIThmetical, MINimum and MAXimum values.				All

Measured Values – Subsystem POWer:GOUTput

The subsystem *POWer:GOUTput* determines and outputs the results of the *Gated Output* measurement. They correspond to the graphical measurement menu *Power*, application *Gated Output,* with its various display elements.

Scalar results
READ[:SCALar]:POWer:GOUTput? Start single shot measurement and return results
FETCh[:SCALar]:POWer:GOUTput? Read out measurement results (unsynchronized)
SAMPle[:SCALar]:POWer:GOUTput? Read out measurement results (synchronized)

Returned values	Value range	Def. value	Def. unit	FW vers.
Mean Output, Limit Lines Matching, Out Of Tolerance	0.0 dBm to +100.0 dBm NMAU | NMAL | INV | OK 0.0% to 100%	NAN INV NAN	dBm – %	V3.05
Description of command				Sig. State
These commands are always queries. They start a measurement and output all scalar measurement results.				All

Burst Power

READ:ARRays:POWer:GOUTput:CURRent?
READ:ARRays:POWer:GOUTput:AVERage?
READ:ARRays:POWer:GOUTput:MINimum?
READ:ARRays:POWer:GOUTput:MAXimum?

Start single shot measurement and return results

FETCh:ARRays:POWer:GOUTput:CURRent?
FETCh:ARRays:POWer:GOUTput:AVERage?
FETCh:ARRays:POWer:GOUTput:MINimum?
FETCh:ARRays:POWer:GOUTput:MAXimum?

Read measurement results (unsynchronized)

SAMPle:ARRays:POWer:GOUTput:CURRent?
SAMPle:ARRays:POWer:GOUTput:AVERage?
SAMPle:ARRays:POWer:GOUTput:MINimum?
SAMPle:ARRays:POWer:GOUTput:MAXimum?

Read measurement results (synchronized)

Returned values	Value range	Def. value	Def. unit	FW vers.
BurstPower[1] (1st value for burst power),	–100.0 dB... + 10.0 dB,	NAN	dB	V3.05
BurstPower[x] (xth value for burst power)	–100.0 dB... + 10.0 dB	NAN	dB	

Description of command	Sig. State
These commands are always queries. They output the burst power versus time at fixed, equidistant test points. The number of measured values is 1664. The measured power is evaluated with 64 chips (i.e. 52 µs) before and after the actual isolated Power Control Group (PCG). Considering an oversampling factor of 1, a total of 64 + 1536 + 64 = 1664 valid samples is returned.	All

Burst Power

READ:SUBarrays:POWer:GOUTput:CURRent?
READ:SUBarrays:POWer:GOUTput:AVERage?
READ:SUBarrays:POWer:GOUTput:MINimum?
READ:SUBarrays:POWer:GOUTput:MAXimum? Start measurement and wait for end ⇒ RUN

FETCh:SUBarrays:POWer:GOUTput:CURRent?
FETCh:SUBarrays:POWer:GOUTput:AVERage?
FETCh:SUBarrays:POWer:GOUTput:MINimum?
FETCh:SUBarrays:POWer:GOUTput:MAXimum? Read measurement results (unsynchronized) ⇒ RUN

SAMPle:SUBarrays:POWer:GOUTput:CURRent?
SAMPle:SUBarrays:POWer:GOUTput:AVERage?
SAMPle:SUBarrays:POWer:GOUTput:MINimum?
SAMPle:SUBarrays:POWer:GOUTput:MAXimum? Read measurement results (synchronized) ⇒ RUN

Measured values	Description	Def. value	Def. unit	FW vers.
BurstPower[1], 1st value for burst power	–100.0 dB... + 10.0 dB,	NAN	dB	V3.05
BurstPower[x], xth value for burst power	–100.0 dB... + 10.0 dB	NAN	dB	

Description of command	Sig. State
These commands are always queries. They output the burst power versus time in the subranges defined by means of the `CONFigure:SUBarrays:POWer:GOUTput` command. The `CONFigure:SUBarrays:POWer:GOUTput` command defines a maximum of 32 subranges. If one of the statistical modes `(ARIThmetical, MINimum, MAXimum)` is set, only one value is returned per subrange. The calculation of *current, average, minimum,* and *maximum* results is explained in Chapter 3 (see *display mode*).	All

CALCulate[:SCALar]:POWer:GOUTput:MATChing:RAMP? **Ramp Matchhin**

Returned values	Description	Def. value	Def. unit	FW vers.
Total Ramp Status	NMAU | NMAL | INV | OK	INV	–	V3.05

Description of command — Sig. State: All

This command is always a query. It indicates whether and in which way the (fixed) limit lines have been exceeded. The following messages may be generated:

NMAU	Tolerance value underflow	*not matching, underflow*
NMAL	Tolerance value exceeded	*not matching, overflow*
INV	Measurement invalid	*invalid*
OK	Tolerance value matched	

CALCulate:ARRay:POWer:GOUTput:MATChing:LIMit? Limit Matching

Returned values	Description		Def. value	Def. unit	FW vers.
Upper Limits (Bit Field),	0x00000000	No limits are exceeded.	NAN		V3.05
	0x00000001	If there was a lower limit line (–100 µs to 0), this limit would be exceeded.			
	0x00000002	Lower Limit exeeded (0 to 1250 µs).			
	0x00000004	If there was a lower limit line (–1250 µs to infinity), it would be exceeded.			
	Any OR operation of these possibities shows the appropriate combination.				
Lower Limits (Bit Field)	0x00000000	No limits are exceeded.			
	0x00000001	Upper limit exceeded (inifinity to –7 µs).			
	0x00000002	If there was an upper limit line (–7 µs to 1257 µs) it would be exeeded.			
	0x00000004	Upper limit exceeded (1257 µs to infinity).			
	Any OR operation of these possibities shows the appropriate combination.				

Description of command	Sig. State
This command is always a query. It indicates whether and in which way the tolerances for the scalar measured values have been exceeded.	All

POWer:OLTResponse

The subsystem *POWer:OLTResponse* measures the MS open loop time response. The subsystem corresponds to the measurement menu *Power,* application *Open Loop Time Response,* and the sections related to this application in the associated popup menu *Power Configuration*.

Control of measurement – Subsystem POWer:OLTResponse

The subsystem *POWer:OLTResponse* controls the open loop time response measurement.

INITiate:POWer:OLTResponse	Start new measurement	⇒	RUN
ABORt:POWer:OLTResponse	Abort running measurement and switch off	⇒	OFF
STOP:POWer:OLTResponse	Stop measurement after current stat. cycle	⇒	STOP
CONTinue:POWer:OLTResponse	Next measurement step (only stepping mode)	⇒	RUN
Description of command			FW vers.
These commands have no query form. They start and stop the power measurement, setting it to the status indicated in the top right column.			V3.00

CONFigure:POWer:OLTResponse:EREPorting[?]				Event Reporting
Enable	Description of parameters	Def. value	Def. unit	FW vers.
ON | OFF	SRQ Service request SOPC Single operation complete SRSQ SRQ and SOPC No reporting	OFF	–	V3.00
Description of command				Sig. State
This command defines the events generated when the measurement is terminated or stopped *(event reporting,* see Chapter 5 of CMU200 manual).				All

FETCh[:SCALar]:POWer:OLTResponse:STATus?				Measurement Status
Return	Description of parameters	Def. value	Def. unit	FW vers.
OFF | RUN | STOP | ERR | STEP | RDY	Measurement in the *OFF* state (`*RST` or `ABORt`) Running (after `INITiate, CONTinue` or `READ`) Stopped (`STOP`) *OFF* (could not be started) Stepping mode *(<stepmode>=STEP)* Stopped according to repetition mode and stop condition	OFF	–	V3.00
Description of command				Sig. State
This command is always a query. It returns the status of the measurement (see Chapters 3 and 5).				All

Test Configuration

The subsystem *POWer:OLTResponse:ENVironment...* configures the generated RF signal. It corresponds to the *Measurement Environment* section in the *Control* tab of the *Power Configuration* menu. The settings are used only if the environment is enabled; see `CONFigure:POWer:OLTResponse:ENVironment:ENABle`.

CONFigure:POWer:OLTResponse:ENVironment:ENABle[?] Environment Enable
<Enable>

<Enable>	Description of parameters	Def. Value	Def. Unit	FW vers.
ON | OFF	Enable or disable environment	ON	–	V3.20

Description of command	Sig. State
This command enables or disables the environment for the *Gated Output* power application.	All

CONFigure:POWer:OLTResponse:ENVironment:POWer:CDMA[?] Initial CDMA Power
<CDMA Power>

<CDMA Power>	Description of parameters	Def. value	Def. unit	FW vers.
–120.0 dBm to –33.0 dBm |	RF1 OUT, 0 dB ext. atten	–60.0	dBm	V3.20
–120.0 dBm to –16.0 dBm |	RF2 OUT, 0 dB ext. atten			
–100.0 dBm to +7.0 dBm |	RF3 OUT, 0 dB ext. atten			
DEFault |	Sets the value to the default setting			
MINimum |	Sets the value to the range minimum			
MAXimum	Sets the value to the range maximum			

Description of command	Sig. State
This command determines the total CDMA output power (absolute value, in dBm) of the CMU prior to the initial power step of the *Open Loop Time Response* measurement. The CDMA Power value range depends on the RF input used and the external attenuation set.	All

CONFigure:POWer:OLTResponse:ENVironment:LEVel:FPICh[?] F-PICH Level
<Pilot Level>

<Pilot Level>	Description of parameters	Def. value	Def. unit	FW vers.
–20.0 dB to –7.0 dB |	Pilot Level	–7.0	dB	V3.20
OFF	F-PICH switched off			

Description of command	Sig. State
This command determines the level in the forward pilot channel of the CMU. The channel power is in units relative to the total CDMA power.	All

CONFigure:POWer:OLTResponse:ENVironment:LEVel:FFCH[?] F-FCH Level
<FCH Level>

<FCH Level>	Description of parameters	Def. value	Def. unit	FW vers.
–20.0 dB to –7.0 dB |	FCH Level	–7.4	dB	V3.20
OFF	F-FCH switched off			

Description of command	Sig. State
This command determines the level in the forward fundamental channel of the CMU. The channel power is in units relative to the total CDMA power.	All

CONFigure:POWer:OLTResponse:ENVironment:LEVel:FSCH:ZERO[?] F-SCH0 Level
<SCH0 Level>

<SCH0 Level>	Description of parameters	Def. value	Def. unit	FW vers.
–20.0 dB to –7.0 dB | OFF	F-SCH0 Level F-SCH0 switched off	OFF	dB	V3.20

Description of command	Sig. State
This command determines the level in the forward SCH0 channel of the CMU. The channel power is in units relative to the total CDMA power.	All

CONFigure:POWer:OLTResponse:ENVironment:LEVel:FSCH:ONE[?] F-SCH1 Level
<SCH1 Level>

<SCH1 Level>	Description of parameters	Def. value	Def. unit	FW vers.
–20.0 dB to –7.0 dB | OFF	F-SCH1 Level F-SCH1 switched off	OFF	dB	V3.20

Description of command	Sig. State
This command determines the level in the forward SCH1 channel of the CMU. The channel power is in units relative to the total CDMA power.	All

CONFigure:POWer:OLTResponse:ENVironment:EBNT:FFCH? F-FCH Eb/Nt
<Eb/Nt>

<Eb/Nt>	Description of parameters	Def. value	Def. unit	FW vers.
–30.969 dB to 18.072 dB	Calculated F-FCH Eb/Nt	–	dB	V3.20

Description of command	Sig. State
This command is always a query. It returns the calculated signal to noise ratio for the forward FCH. This quantity is undefined unless the AWGN generator is turned on (`CONFigure:POWer:OLTResponse:ENVironment:IMPairments:LEVel:AWGN`). The quoted range of values is valid for data rates between 9.6 kbps and 153.6 kbps; see *Eb/Nt Calculation* in Chapter 4.	All

CONFigure:POWer:OLTResponse:ENVironment:EBNT:FSCH:ZERO? F-SCH0 Eb/Nt
<Eb/Nt>

<Eb/Nt>	Description of parameters	Def. value	Def. unit	FW vers.
–30.969 dB to 18.072 dB	Calculated F-SCH0 Eb/Nt	–	dB	V3.20

Description of command	Sig. State
This command is always a query. It returns the calculated signal to noise ratio for the forward SCH0. This quantity is undefined unless the AWGN generator is turned on (`CONFigure:POWer:OLTResponse:ENVironment:IMPairments:LEVel:AWGN`). The quoted range of values is valid for data rates between 9.6 kbps and 153.6 kbps; see *Eb/Nt Calculation* in Chapter 4.	All

CONFigure:POWer:OLTResponse:ENVironment:EBNT:FSCH:ONE? ***<Eb/Nt>***				F-SCH1 Eb/Nt
<Eb/Nt>	Description of parameters	Def. value	Def. unit	FW vers.
–30.969 dB to 18.072 dB	Calculated F-SCH1 Eb/Nt	–	dB	V3.20
Description of command				Sig. State
This command is always a query. It returns the calculated signal to noise ratio for the forward SCH1. This quantity is undefined unless the AWGN generator is turned on (`CONFigure:POWer:OLTResponse:ENVironment:IMPairments:LEVel:AWGN`). The quoted range of values is valid for data rates between 9.6 kbps and 153.6 kbps; see *Eb/Nt Calculation* in Chapter 4.				All

CONFigure:POWer:OLTResponse:ENVironment:FRATe:FFCH?				Frame Rate
<Frame Rate>	Description of parameters	Def. value	Def. unit	FW vers.
FULL	Frames at the full rate set	FULL	–	V3.20
Description of command				Sig. State
This command is always a query and returns the fixed frame rate for *Open Loop Time Response* measurements.				All

CONFigure:POWer:OLTResponse:ENVironment:IMPairments:AWGN[?] ***<AWGN Level>***				AWGN Level
<AWGN Level>	Description of parameters	Def. value	Def. unit	FW vers.
–20.0 dB to +4.0 dB | DEFault | MINimum | MAXimum | OFF,	AWGN level Sets the value to the default setting Sets the value to the range minimum Sets the value to the range maximum	OFF	dB	V3.20
Description of command				Sig. State
This command determines an Additional White Gaussian Noise level to impair the CMU output signal.				All

CONFigure:POWer:OLTResponse:ENVironment:IMPairments:FOFFset[?] ***<BS Freq Offset>***				BS Frequency Offset
<BS Freq Offset>	Description of parameters	Def. value	Def. unit	FW vers.
–50.0 kHz to +50.0 kHz | DEFault | MINimum | MAXimum | OFF	BS frequency offset Sets the value to the default setting Sets the value to the range minimum Sets the value to the range maximum	OFF	Hz	V3.20
Description of command				Sig. State
This command determines a frequency offset to impair the CMU output signal.				All

CONFigure:POWer:OLTResponse:ENVironment:IMPairments:ITFer[?] ***<FER>***				Injected Tx FER
<FER>	Description of parameters	Def. value	Def. unit	FW vers.
0% to 50% | OFF | ON	Injected Tx FER Switch FER injection off (equiv. to 0%) Re-activate FER injection, using the previously defined value	OFF	–	V3.20
Description of command				Sig. State
This command defines a percentage of faulty (i.e. erasure) frames that the CMU injects into all traffic channels of its BS Signal.				All

CONFigure:POWer:OLTResponse:ENVironment:PCBits?				Power Control Bits
Response	Description of parameters	Def. value	Def. unit	FW vers.
HOLD	Auto mode, closed-loop operation	–	–	V3.20
Description of command				Sig. State
This command is always a query and returns the power control bit sequence that the CMU sends to the mobile station to control its output power.				All

CONFigure:POWer:OLTResponse:PSTep[?] ***<Power Step>***				BS Power Step
<Power Step>	Description of parameters	Def. value	Def. unit	FW vers.
0.0 dB to +100.0 dB	BS power step	+20	dB	V3.00
Description of command				Sig. State
This command sets the power step of the CMU.				All

CONFigure:POWer:OLTResponse:PSDirection[?] ***<Power Step Direction>***				Power Step Direction
<Power Step Direction>	Description of parameters	Def. value	Def. unit	FW vers.
UP | Down	BS power step direction	UP	–	V3.00
Description of command				Sig. State
This command sets the power step direction of the CMU.				All

Measured Values – Subsystem POWer:OLTResponse

The subsystem *POWer:OLTResponse* determines and outputs the results of the Open Loop Time Response measurement. They correspond to the graphical measurement menu *Power*, application *Open Loop Time Response,* with its various display elements.

	Scalar results:
READ[:SCALar]:POWer:OLTResponse?	Start single shot measurement and return results
FETCh[:SCALar]:POWer:OLTResponse?	Read out meas. results (unsynchronized)
SAMPle[:SCALar]:POWer:OLTResponse?	Read out measurement results (synchronized)

Returned values	Value range	Def. value	Def. unit	FW vers.
Initial MS Power,	–100.0 dBm to +20.0 dBm	NAN	dBm	V3.00
Initial BS Power,	–100.0 dBm to +20.0 dBm	NAN	dBm	
Current BS Power,	–100.0 dBm to +20.0 dBm	NAN	dBm	
Limit Matching	NMAL | NMAU | INV | OK	INV	–	

Description of command	Sig. State
These commands are always queries. They start a measurement and output all scalar measurement results. The calculation of results in an *average* or *peak* measurement is described in Chapter 3 (see *display modes*).The following messages may be output for *Limit Matching:*	CONN

NMAU	Tolerance value underflow	*not matching, underflow*
NMAL	Tolerance value exceeded	*not matching, overflow*
INV	Measurement invalid	*invalid*
OK	Tolerance value matched	

	Burst Power
READ:ARRay:POWer:OLTResponse?	Start single shot measurement and return results
FETCh:ARRay:POWer:OLTResponse?	Read meas. results (unsynchronized)
SAMPle:ARRay:POWer:OLTResponse?	Read results (synchronized)

Returned values	Description of parameters	Def. value	Def. unit	FW vers.
–100.0 dB... + 10.0 dB,	BurstPower[1], 1st value for burst power	NAN	dB	V3.00
...	...	...	...	
–100.0 dB... + 10.0 dB	BurstPower[x], xth value for burst power	NAN	dB	

Description of command	FW vers.
These commands are always queries. They output the burst power versus time at fixed, equidistant test points. The number of measured values is 320. This corresponds to a time interval of 100 milliseconds.	CONN

MODulation Measurements

The subsystem *MODulation:OVERview* measures the modulation parameters of the MS transmitter output signal. The subsystem corresponds to the measurement menu *Modulation* and the associated popup menu *Modulation Configuration.*

Common Settings – Subsystem MODulation:OEMP (O-QPSK and H-PSK)

The subsystem *MODulation:OEMP…* configures the generated RF signal and defines the tolerance values. The settings are valid for all *Modulation* measurement applications.

Measurement Environment – Subsystem MODulation:OEMP…:ENVironment

The subsystem *MODulation:OEMP:ENVironment…* configures the generated RF signal. It corresponds to the *Measurement Environment* section in the *Control* tab of the *Modulation Configuration* menu. The settings are used only if the environment is enabled; see `CONFigure:MODulation:OEMP:…:ENVironment:ENABle`.

CONFigure:MODulation:OEMP[:OQPSk]:ENVironment:ENABle[?] **CONFigure:MODulation:OEMP:HPSK:ENVironment:ENABle[?]** ***<Enable>***				Environment Enable
<Enable>	Description of parameters	Def. Value	Def. Unit	FW vers.
ON | OFF	Enable or disable environment	ON	–	V3.20
Description of command				Sig. State
These commands enable or disable the environment for the *Modulation* measurement applications.				All

CONFigure:MODulation:OEMP[:OQPSk]:ENVironment:POWer:CDMA[?] **CONFigure:MODulation:OEMP:HPSK:ENVironment:POWer:CDMA[?]** **<CDMA Power>**				CDMA Power
<CDMA Power>	Description of parameters	Def. value	Def. unit	FW vers.
–120.0 dBm to –33.0 dBm | –120.0 dBm to –16.0 dBm | –100.0 dBm to +7.0 dBm | DEFault | MINimum | MAXimum	RF1 OUT, 0 dB ext. atten RF2 OUT, 0 dB ext. atten RF3 OUT, 0 dB ext. atten Sets the value to the default setting Sets the value to the range minimum Sets the value to the range maximum	–50.0	dBm	V3.20
Description of command				Sig. State
These commands determine the total CDMA output power (absolute value, in dBm) of the CMU. The CDMA Power value range depends on the RF input used and the external attenuation set.				All

CONFigure:MODulation:OEMP[:OQPSk]:ENVironment:LEVel:FPICh[?] F-PICH Level
CONFigure:MODulation:OEMP:HPSK:ENVironment:LEVel:FPICh[?]
<Pilot Level>

<Pilot Level>	Description of parameters	Def. value	Def. unit	FW vers.
–20.0 dB to –7.0 dB | OFF	Pilot Level F-PICH switched off	–7.0	dB	V3.20

Description of command	Sig. State
These commands determine the level in the forward pilot channel of the CMU. The channel power is in units relative to the total CDMA power.	All

CONFigure:MODulation:OEMP[:OQPSk]:ENVironment:LEVel:FFCH[?] F-FCH Level
CONFigure:MODulation:OEMP:HPSK:ENVironment:LEVel:FFCH[?]
<FCH Level>

<FCH Level>	Description of parameters	Def. value	Def. unit	FW vers.
–20.0 dB to –7.0 dB | OFF	FCH Level F-FCH switched off	–7.4	dB	V3.20

Description of command	Sig. State
These commands determines the level in the forward fundamental channel of the CMU. The channel power is in units relative to the total CDMA power.	All

CONFigure:MODulation:OEMP[:OQPSk]:ENVironment:LEVel:FSCH:ZERO[?] F-SCH0 Level
CONFigure:MODulation:OEMP:HPSK:ENVironment:LEVel:FSCH:ZERO[?]
<SCH0 Level>

<SCH0 Level>	Description of parameters	Def. value	Def. unit	FW vers.
–20.0 dB to –7.0 dB | OFF	F-SCH0 Level F-SCH0 switched off	OFF	dB	V3.20

Description of command	Sig. State
These commands determine the level in the forward SCH0 channel of the CMU. The channel power is in units relative to the total CDMA power.	All

CONFigure:MODulation:OEMP[:OQPSk]:ENVironment:LEVel:FSCH:ONE[?] F-SCH1 Level
CONFigure:MODulation:OEMP:HPSK:ENVironment:LEVel:FSCH:ONE[?]
<SCH1 Level>

<SCH1 Level>	Description of parameters	Def. value	Def. unit	FW vers.
–20.0 dB to –7.0 dB | OFF	F-SCH1 Level F-SCH1 switched off	OFF	dB	V3.20

Description of command	Sig. State
These commands determine the level in the forward SCH1 channel of the CMU. The channel power is in units relative to the total CDMA power.	All

CONFigure:MODulation:OEMP[:OQPSk]:ENVironment:EBNT:FFCH? F-FCH Eb/Nt
CONFigure:MODulation:OEMP:HPSK:ENVironment:EBNT:FFCH?
<Eb/Nt>

<Eb/Nt>	Description of parameters	Def. value	Def. unit	FW vers.
–30.969 dB to 18.072 dB	Calculated F-FCH Eb/Nt	–	dB	V3.20

Description of command	Sig. State
These commands are always queries. They return the calculated signal to noise ratio for the forward FCH. This quantity is undefined unless the AWGN generator is turned on (`CONFigure:MODulation:OEMP[:OQPSk]:ENVironment:IMPairments:LEVel:AWGN`). The quoted range of values is valid for data rates between 9.6 kbps and 153.6 kbps; see *Eb/Nt Calculation* in Chapter 4.	All

CONFigure:MODulation:OEMP:HPSK:ENVironment:EBNT:FSCH:ZERO? F-SCH0 Eb/Nt
CONFigure:MODulation:OEMP[:OQPSk]:ENVironment:EBNT:FSCH:ZERO?
<Eb/Nt>

<Eb/Nt>	Description of parameters	Def. value	Def. unit	FW vers.
–30.969 dB to 18.072 dB	Calculated F-SCH0 Eb/Nt	–	dB	V3.20

Description of command	Sig. State
These commands are always queries. They return the calculated signal to noise ratio for the forward SCH0. This quantity is undefined unless the AWGN generator is turned on (`CONFigure:MODulation:OEMP:HPSK:ENVironment:IMPairments:LEVel:AWGN`). The quoted range of values is valid for data rates between 9.6 kbps and 153.6 kbps; see *Eb/Nt Calculation* in Chapter 4.	All

CONFigure:MODulation:OEMP[:OQPSk]:ENVironment:EBNT:FSCH:ONE? F-SCH1 Eb/Nt
CONFigure:MODulation:OEMP:HPSK:ENVironment:EBNT:FSCH:ONE?
<Eb/Nt>

<Eb/Nt>	Description of parameters	Def. value	Def. unit	FW vers.
–30.969 dB to 18.072 dB	Calculated F-SCH1 Eb/Nt	–	dB	V3.20

Description of command	Sig. State
These commands are always queries. They return the calculated signal to noise ratio for the forward SCH1. This quantity is undefined unless the AWGN generator is turned on (`CONFigure:MODulation:OEMP[:OQPSk]:ENVironment:IMPairments:LEVel:AWGN`). The quoted range of values is valid for data rates between 9.6 kbps and 153.6 kbps; see *Eb/Nt Calculation* in Chapter 4.	All

CONFigure:MODulation:OEMP[:OQPSk]:ENVironment:FRATe:FFCH[?] Frame Rate
CONFigure:MODulation:OEMP:HPSK:ENVironment:FRATe:FFCH[?]
<Frame Rate>

<Frame Rate>	Description of parameters	Def. value	Def. unit	FW vers.
EIGHth |	Frames at 1/8 of the rate set	FULL	–	V3.20
QUARter |	Frames at 1/4 of the rate set			
HALF |	Frames at 1/2 of the rate set			
FULL |	Frames at the full rate set			
DEFault				

Description of command	Sig. State
These commands set the frame rate for the variable rate traffic channel.	All

CONFigure:MODulation:OEMP[:OQPSk]:ENVironment:IMPairments:AWGN[?] AWGN Level
CONFigure:MODulation:OEMP:HPSK:ENVironment:IMPairments:AWGN[?]
<AWGN Level>

<AWGN Level>	Description of parameters	Def. value	Def. unit	FW vers.
–20.0 dB to +4.0 dB | DEFault | MINimum | MAXimum | OFF,	AWGN level Sets the value to the default setting Sets the value to the range minimum Sets the value to the range maximum	OFF	dB	V3.20

Description of command	Sig. State
These commands determine an Additional White Gaussian Noise level to impair the CMU output signal.	All

CONFigure:MODulation:OEMP[:OQPSk]:ENVironment:IMPairments:FOFFset[?] BS Frequency Offset
CONFigure:MODulation:OEMP:HPSK:ENVironment:IMPairments:FOFFset[?]
<BS Freq Offset>

<BS Freq Offset>	Description of parameters	Def. value	Def. unit	FW vers.
–50.0 kHz to +50.0 kHz | DEFault | MINimum | MAXimum | OFF	BS frequency offset Sets the value to the default setting Sets the value to the range minimum Sets the value to the range maximum	OFF	Hz	V3.20

Description of command	Sig. State
These commands determine a frequency offset to impair the CMU output signal.	All

CONFigure:MODulation:OEMP[:OQPSk]:ENVironment:IMPairments:ITFer[?] Injected Tx FER
CONFigure:MODulation:OEMP:HPSK:ENVironment:IMPairments:ITFer[?]
<FER>

<FER>	Description of parameters	Def. value	Def. unit	FW vers.
0% to 50% | OFF | ON	Injected Tx FER Switch FER injection off (equiv. to 0%) Re-activate FER injection, using the previously defined value	OFF	–	V3.20

Description of command	Sig. State
These commands define a percentage of faulty (i.e. erasure) frames that the CMU injects into all traffic channels of its BS Signal.	All

CONFigure:MODulation:OEMP[:OQPSk]:ENVironment:PCBits[?] Power Control Bits
CONFigure:MODulation:OEMP:HPSK:ENVironment:PCBits[?]
<Power Control Bits>

Response	Description of parameters	Def. value	Def. unit	FW vers.
OFF | AUTomatic | HOLD | ADOW | AUP | RTES | PATTern	Disable power control bits Auto mode, closed-loop operation Alternating up/down control bits All power control bits down All power control bits up Range test mode Pattern defined by means of the `CONF:BSS:PCB:PATTern...` commands	AUT	–	V3.20

Description of command	Sig. State
These commands select the power control bit sequence that the CMU sends to the mobile station to control its output power.	All

Tolerance values – Subsystem MODulation:OEMP:LIMit

The subsystem *MODulation:OEMP:LIMit* defines tolerance values for the modulation measurement in all four applications. The subsystem corresponds to the *Limits* tab in the popup menu *Modulation Configuration.*

Note: *The modulation scheme reference O-QPSK is optional in the commands to remain compatible with cdmaOne. O-QPSK supports radio configurations 1 and 2. H-PSK supports radio configurations 3 and 4.*

Limits

CONFigure:MODulation:OEMP[:OQPSk]:CMMax:LIMit[:SCALar]:SYMMetric[:COMBined][?]
CONFigure:MODulation:OEMP:HPSK:CMMax:LIMit[:SCALar]:SYMMetric[:COMBined][?]

<Limit_Peak_EVM>, <Enable>, <Limit_RMS_EVM>, <Enable>, <Limit_Peak_ME>, <Enable>, <Limit_RMS_ME>, <Enable>, <Limit_Peak_PE>, <Enable>, <Limit_RMS_PE>, <Enable>, <Carrier_Feedthrough_Limit>, <Enable>, <IQ_Imbalance_Limit>, <Enable>, <Carrier_Freq_Error_Limit>, <Enable>, <Tx_Time_Error_Limit>, <Enable>, <WFM_Quality_Limit>, <Enable>

<Enable>	Description of parameters	Def. value	Def. unit	
ON | OFF,	Switch limit check for parameter preceding *<Enable>* on or off	ON	–	

Parameters	Description of parameters	Def. value	Def. unit	FW vers.
0.0 % to +100.0 %,	(EVM) Error Vector Magnitude Error Peak	+33.4	%	V3.05
0.0 % to +100.0 %,	(EVM) Error Vector Magnitude Error RMS	+23.6	%	
0.0 % to +100.0 %,	(ME) Magnitude Error Peak	+33.4	%	
0.0 % to +100.0 %,	(ME) Magnitude Error RMS	+23.6	%	
0.0 deg to +45.0 deg,	(PE) Phase Error Peak	+19.6	deg	
0.0 deg to +45.0 deg,	(PE) Phase Error RMS	+13.6	deg	
–120.0 dB to –20.0 dB,	Carrier Feedthrough	–25.0	dB	
–120.0 dB to –20.0 dB,	IQ Imbalance	–30.0	dB	
0 Hz to 1000 Hz,	Carrier Frequency Error	+300	Hz	
0.0 μs to 10.0 μs	Transmit Time Error	1.0	s	
0.0 to 1.0	Waveform Quality	0.944	–	

Description of command	Sig. State
This command defines upper limits for the different traces and for the scalar modulation parameters derived from them. The keyword `CMMax` refers to the *Current* and *Max./Min.* traces. After each parameter definition, the limit check for this parameter can be enabled or disabled. Limit definition and enabling of the limit check can be done separately.	All

Limits

CONFigure:MODulation:OEMP[:OQPSk]:AVERage:LIMit[:SCALar]:SYMMetric[:COMBined][?]
CONFigure:MODulation:OEMP:HPSK:AVERage:LIMit[:SCALar]:SYMMetric[:COMBined][?]

<Limit_Peak_EVM>, <Enable>, <Limit_RMS_EVM>, <Enable>, <Limit_Peak_ME>, <Enable>, <Limit_RMS_ME>, <Enable>, <Limit_Peak_PE>, <Enable>, <Limit_RMS_PE>, <Enable>, <Carrier_Feedthrough_Limit>, <Enable>, <IQ_Imbalance_Limit>, <Enable>, <Carrier_Freq_Error_Limit>, <Enable>, <Tx_Time_Error_Limit>, <Enable>, <WFM_Quality_Limit>, <Enable>

<Enable>	Description of parameters	Def. value	Def. unit	
ON | OFF,	Switch limit check for parameter preceding *<Enable>* on or off	ON	–	

Parameters	Description of parameters	Def. value	Def. unit	FW vers.
0.0 % to +100.0 %,	(EVM) Error Vector Magnitude Error Peak	+33.4	%	V3.05
0.0 % to +100.0 %,	(EVM) Error Vector Magnitude Error RMS	+23.6	%	
0.0 % to +100.0 %,	(ME) Magnitude Error Peak	+33.4	%	
0.0 % to +100.0 %,	(ME) Magnitude Error RMS	+23.6	%	
0.0 deg to +45.0 deg,	(PE) Phase Error Peak	+19.6	deg	
0.0 deg to +45.0 deg,	(PE) Phase Error RMS	+13.6	deg	
–120.0 dB to –20.0 dB,	Carrier Feedthrough	–25.0	dB	
–120.0 dB to –20.0 dB,	IQ Imbalance	–30.0	dB	
0 Hz to 1000 Hz,	Carrier Frequency Error	+300	Hz	
0.0 µs to 10.0 µs	Transmit Time Error	1.0	s	
0.0 to 1.0	Waveform Quality	0.944	–	

Description of command	Sig. State
This command defines upper limits for the different traces and for the scalar modulation parameters derived from them. The keyword `AVERage` refers to the *Average* trace. After each parameter definition, the limit check for this parameter can be enabled or disabled. Limit definition and enabling of the limit check can be done separately.	All

Limit values

CONFigure:MODulation:OEMP[:OQPSk]:CMMax:LIMit[:SCALar]:SYMMetric[:COMBined]:VALue[?]
CONFigure:MODulation:OEMP:HPSK:CMMax:LIMit[:SCALar]:SYMMetric[:COMBined]:VALue[?]

<Limit_Peak_EVM>, <Limit_RMS_EVM>, <Limit_Peak_ME>, <Limit_RMS_ME>, <Limit_Peak_PE>, <Limit_RMS_PE>, <Carrier_Feedthrough_Limit>, <IQ_Imbalance_Limit>, <Carrier_Freq_Error_Limit>, <Tx_Time_Error_Limit>, <WFM_Quality_Limit>

Parameter	Description of parameters	Def. value	Def. unit	FW vers.
0.0 % to +100.0 %,	(EVM) Error Vector Magnitude Error Peak	+33.4	%	V3.05
0.0 % to +100.0 %,	(EVM) Error Vector Magnitude Error RMS	+23.6	%	
0.0 % to +100.0 %,	(ME) Magnitude Error Peak	+33.4	%	
0.0 % to +100.0 %,	(ME) Magnitude Error RMS	+23.6	%	
0.0 deg to +45.0 deg,	(PE) Phase Error Peak	+19.6	deg	
0.0 deg to +45.0 deg,	(PE) Phase Error RMS	+13.6	deg	
–120.0 dB to –20.0 dB,	Carrier Feedthrough	–25.0	dB	
–120.0 dB to –20.0 dB,	IQ Imbalance	–30.0	dB	
0 Hz to 1000 Hz,	Carrier Frequency Error	+300	Hz	
0.0 µs to 10.0 µs,	Transmit Time Error	1.0	s	
0.0 to 1.0	Waveform Quality	0.944	–	

Description of command	Sig. State
This command defines upper limits for the different traces and for the scalar modulation parameters derived from them. The keyword `CMMax` refers to the *Current* and *Max./Min.* traces.	All

Limit values

CONFigure:MODulation:OEMP[:OQPSk]:AVERage:LIMit[:SCALar]:SYMMetric[:COMBined]:VALue[?]
CONFigure:MODulation:OEMP:HPSK:AVERage:LIMit[:SCALar]:SYMMetric[:COMBined]:VALue[?]

<Limit_Peak_EVM>, <Limit_RMS_EVM>, <Limit_Peak_ME>, <Limit_RMS_ME>, <Limit_Peak_PE>, <Limit_RMS_PE>, <Carrier_Feedthrough_Limit>, <IQ_Imbalance_Limit>, <Carrier_Freq_Error_Limit>, <Tx_Time_Error_Limit>, <WFM_Quality_Limit>

Parameter	Description of parameters	Def. value	Def. unit	FW vers.
0.0 % to +100.0 %,	(EVM) Error Vector Magnitude Error Peak	+33.4	%	V3.05
0.0 % to +100.0 %,	(EVM) Error Vector Magnitude Error RMS	+23.6	%	
0.0 % to +100.0 %,	(ME) Magnitude Error Peak	+33.4	%	
0.0 % to +100.0 %,	(ME) Magnitude Error RMS	+23.6	%	
0.0 deg to +45.0 deg,	(PE) Phase Error Peak	+19.6	deg	
0.0 deg to +45.0 deg,	(PE) Phase Error RMS	+13.6	deg	
–120.0 dB to –20.0 dB,	Carrier Feedthrough	–25.0	dB	
–120.0 dB to –20.0 dB,	IQ Imbalance	–30.0	dB	
0 Hz to 1000 Hz,	Carrier Frequency Error	+300	Hz	
0.0 μs to 10.0 μs,	Transmit Time Error	1.0	s	
0.0 to 1.0	Waveform Quality	0.944	–	

Description of command	Sig. State
This command defines upper limits for the different traces and for the scalar modulation parameters derived from them. The keyword `AVERage` refers to the *Average* trace.	All

Limit Enable

CONFigure:MODulation:OEMP[:OQPSk]:CMMax:LIMit[:SCALar]:SYMMetric[:COMBined]:ENABle[?]
CONFigure:MODulation:OEMP:HPSK:CMMax:LIMit[:SCALar]:SYMMetric[:COMBined]:ENABle[?]

<Limit_Peak_EVM>, <Limit_RMS_EVM>, <Limit_Peak_ME>, <Limit_RMS_ME>, <Limit_Peak_PE>, <Limit_RMS_PE>, <Carrier_Feedthrough_Limit>, <IQ_Imbalance_Limit>, <Carrier_Freq_Error_Limit>, <Tx_Time_Error_Limit>, <WFM_Quality_Limit>

<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | OFF	Switch limit check for corresponding parameter on or off.	ON	–	V3.05

Description of command	Sig. State
This command enables or disables the limit check for the different traces and for the scalar modulation parameters derived from them. The keyword `CMMax` refers to the *Current* and *Max./Min.* traces.	All

Limit Enable

CONFigure:MODulation:OEMP[:OQPSk]:AVERage:LIMit[:SCALar]:SYMMetric[:COMBined]:ENABle[?]
CONFigure:MODulation:OEMP:HPSK:AVERage:LIMit[:SCALar]:SYMMetric[:COMBined]:ENABle[?]

<Limit_Peak_EVM>, <Limit_RMS_EVM>, <Limit_Peak_ME>, <Limit_RMS_ME>, <Limit_Peak_PE>, <Limit_RMS_PE>, <Carrier_Feedthrough_Limit>, <IQ_Imbalance_Limit>, <Carrier_Freq_Error_Limit>, <Tx_Time_Error_Limit>, <WFM_Quality_Limit>

<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | OFF	Switch limit check for corresponding parameter on or off.	ON	–	V3.05

Description of command	Sig. State
This command enables or disables the limit check for the different traces and for the scalar modulation parameters derived from them. The keyword `AVERage` refers to the *Average* trace.	All

DEFault:MODulation:OEMP[:OQPSk]:LIMit[?] **DEFault:MODulation:OEMP:HPSK:LIMit[?]** ***<Enable>***				Default Settings
<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | OFF	The parameters are set to their default values Some or all parameters differ from their default values	ON	–	V3.05
Description of command				Sig. State
If used as a setting command with the parameter *ON,* this command sets all parameters of the subsystem MODulation:OEMP:LIMit to their default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF).*				All

MODulation:OVERview

The subsystem *MODulation:OVERview* measures general scalar modulation parameters. It corresponds to the softkey *Overview O-QPSK* (*H-PSK*) in the measurement menu *Modulation.*

Note: *The modulation scheme reference O-QPSK is optional in the commands to remain compatible with cdmaOne. O-QPSK supports radio configurations 1 and 2. H-PSK supports radio configurations 3 and 4.*

INITiate:MODulation:OVERview[:OQPSk]	Start new measurement		⇒ *RUN*
ABORt:MODulation:OVERview[:OQPSk]	Abort running measurement and switch off		⇒ *OFF*
STOP:MODulation:OVERview[:OQPSk]	Stop measurement after current stat. cycle		⇒ *STOP*
CONTinue:MODulation:OVERview[:OQPSk]	Next measurement step (only *stepping mode*)		⇒ *RUN*
INITiate:MODulation:OVERview:HPSK	Start new measurement		⇒ *RUN*
ABORt:MODulation:OVERview:HPSK	Abort running measurement and switch off		⇒ *OFF*
STOP:MODulation:OVERview:HPSK	Stop measurement after current stat. cycle		⇒ *STOP*
CONTinue:MODulation:OVERview:HPSK	Next measurement step (*stepping mode*)		⇒ *RUN*
Description of command		Sig. State	FW vers.
These commands have no query form. They start and stop the modulation measurement, setting it to the status indicated in the top right column.		All	V3.05

CONFigure:MODulation:OVERview[:OQPSk]:EREPorting[?] **CONFigure:MODulation:OVERview:HPSK:EREPorting[?]** ***<Report Mode>***				Event Reporting
<Report Mode>	Description of parameters	Def. value	Def. unit	FW vers.
SRQ | SOPC | SRSQ | OFF | DEFault	Service request Single operation complete SRQ and SOPC No reporting Sets the value to the default setting	OFF	–	V3.05
Description of command				Sig. State
This command defines the events generated when the measurement is terminated or stopped (see *Event Reporting* in Chapter 5 of the CMU manual).				All

FETCh[:SCALar]:MODulation:OVERview[:OQPSk]:STATus?
FETCh[:SCALar]:MODulation:OVERview:HPSK:STATus?
Measurement Status

Returned values	Description of parameters	Def. value	Def. unit	FW vers.
OFF |	Measurement in the OFF state (*RST or ABORt)	OFF	–	V3.05
RUN |	Running (after INITiate, CONTinue or READ)			
STOP |	Stopped (STOP)			
ERR |	OFF (could not be started)			
STEP |	Stepping mode (<stepmode>=STEP)			
RDY	Stopped according to repetition mode and stop condition			
1 to 10000 |	Counter for current statistics cycle	NONE	–	
NONE	No counting mode set			
1 to 1000	Counter for current evaluation period within a cycle	NONE	–	
NONE	Statistic count set to off			

Description of command	Sig. State
This command is always a query. It returns the status of the measurement (see Chapters 3 and 5).	All

Subsystem MODulation:OVERview:CONTrol

The subsystem *MODulation:OVERview:CONTrol* configures the modulation measurement. It corresponds to the tabs *Control* and *Statistics* in the popup menu *Modulation Configuration.*

Note: *The application type O-QPSK is omitted from the commands to remain compatible with cdmaOne. The application type H-PSK contains the type in the command. O-QPSK supports radio configurations 1 and 2. H-PSK supports radio configurations 3 and 4.*

CONFigure:MODulation:OVERview[:OQPSk]:CONTrol[?]
CONFigure:MODulation:OVERview:HPSK:CONTrol[?]
<Statistic Count>, <Repetition>, <Stop Cond>, <Step Mode>
Scope of Measurement

<Statistic Count>	Description of parameters	Def. value	Def. unit	
1 to 1000,	Number of bursts per statistics cycle	100	–	
<Repetition>	**Description of parameters**	**Def. value**	**Def. unit**	
1 to 10000 |	Multiple measurement (counting, until Status = STEP | RDY)	SING	–	
CONTinuous |	Continuous measurement (until STOP or ABORT)			
SINGleshot |	Single shot measurement (until Status = RDY)			
DEFault,	Sets the value to the default setting			
<Stop Cond>	**Description of parameters**	**Def. value**	**Def. unit**	
NONE |	Continue measurement even in case of error	NONE	–	
SONerror |	Stop measurement in case of error *(stop on error)*			
DEFault,	Sets the value to the default setting			
<Step Mode>	**Description of parameters**	**Def. value**	**Def. unit**	**FW-Vers.**
STEP |	Interrupt measurement after each statistics cycle	NONE	–	V3.05
NONE |	Continue measurement according to its rep. Mode			
DEFault	Sets the value to the default setting			

Description of command	Sig. State
This command combines the `...CONTrol:STATistics` and the `...CONTrol:REPetition` commands, see below.	All

CONFigure:MODulation:OVERview[:OQPSk]:CONTrol:STATistics[?] Statistic Count
CONFigure:MODulation:OVERview:HPSK:CONTrol:STATistics[?]
<Statistic Count>

<Statistic Count>	Description of parameters	Def. value	Def. unit	FW-Vers.
1 to 1000	Number of bursts per statistics cycle	100	–	V3.05
Description of command				**Sig. State**
This command specifies the type of measured values and defines the number of bursts forming a statistics cycle.				All

CONFigure:MODulation:OVERview[:OQPSk]:CONTrol:REPetition[?] Test Cycles
CONFigure:MODulation:OVERview:HPSK:CONTrol:REPetition[?]
<Repetition>, <Stop Cond>, <Step Mode>

<Repetition>	Description of parameters	Def. value	Def. unit	
1 to 10000 |	Multiple measurement (counting, until Status = STEP | RDY)	SING	–	
CONTinuous |	Continuous measurement (until STOP or ABORT)			
SINGleshot |	Single shot measurement (until Status = RDY)			
DEFault,	Sets the value to the default setting			
<Stop Cond>	**Description of parameters**	**Def. value**	**Def. unit**	
NONE |	Continue measurement even in case of error	NONE	–	
SONerror |	Stop measurement in case of error *(stop on error)*			
DEFault,	Sets the value to the default setting			
<Step Mode>	**Description of parameters**	**Def. value**	**Def. unit**	**FW vers.**
STEP |	Interrupt measurement after each statistics cycle	NONE	–	V3.05
NONE |	Continue measurement according to its rep. Mode			
DEFault	Sets the value to the default setting			
Description of command				**Sig. State**
This command determines the repetition mode, stop condition, and stepping mode for the measurement. **Note:** *In the case of READ commands (`READ:...`), the <Repetition> parameter has no effect; the measurement is always stopped after a single shot.*				All

Measured Values – Subsystem MODulation:OVERview

The subsystem *MODulation:OVERview* measures and returns the modulation parameters and compares them with the tolerance values. The subsystem corresponds to the various output elements in the measurement menu *MODulation*, application *Overview*.

Note: *The modulation scheme reference O-QPSK is optional in the commands to remain compatible with cdmaOne. O-QPSK supports radio configurations 1 and 2. H-PSK supports radio configurations 3 and 4.*

Scalar Results

READ[:SCALar]:MODulation:OVERview[:OQPSk]?	Start single shot measurement and return results
FETCh[:SCALar]:MODulation:OVERview[:OQPSk]?	Read out meas. results (unsynchronized)
SAMPle[:SCALar]:MODulation:OVERview[:OQPSk]?	Read out measurement results (synchronized)
READ[:SCALar]:MODulation:OVERview:HPSK?	Start single shot measurement and return results
FETCh[:SCALar]:MODulation:OVERview:HPSK?	Read out meas. results (unsynchronized)
SAMPle[:SCALar]:MODulation:OVERview:HPSK?	Read out measurement results (synchronized)

Returned values	Value range	Def. value	Def. unit	FW vers.
EVM Peak (x3),	0.0 % to 100.0 %	NAN	%	V3.05
EVM RMS (x3),	0.0 % to 100.0 %	NAN	%	
Magn Error Peak (x3),	0.0 % to 100.0 %	NAN	%	
Magn Error RMS (x3),	0.0 % to 100.0 %	NAN	%	
Phase Error Peak (x3),	0.0 deg to +45.0 deg	NAN	deg	
Phase Error RMS (x3),	0.0 deg to +45.0 deg	NAN	deg	
Overv. CarrierFeedth (x3),	–120.0 dB to -20.0 dB	NAN	dB	
Overv. I/Q Imbalance (x3),	–120.0 dB to -20.0 dB (QPSK only)	NAN	dB	
Overv. Carr Freq Error (x3),	0 Hz to 1000 Hz	NAN	Hz	
Overv. Tx Time Error (x3),	0 µs to 10 µs	NAN	µs	
Overv. WFM Quality (x3),	0 to 1	NAN	–	
Overv. MS Power (x3)	–133.0 dBm to +19.0 dBm	NAN	dB	
Overv. Current Statistics	1 to 1000	NAN	–	
Overv. Limit Matching	0.0 % to 100.0 %	NAN	%	

Description of command	Sig. State
These commands are always queries. They start a modulation measurement and output all scalar measurement results (see Chapter 4). The calculation of results in an *average* or *peak* measurement is described in Chapter 3 (see *calculation of statistical quantities*). The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average,* and the *MMax* value.	All

CALCulate[:SCALar]:MODulation:OVERview[:OQPSk]:MATChing:LIMit?
CALCulate[:SCALar]:MODulation:OVERview:HPSK:MATChing:LIMit?
Limit Matching

Returned values	Value range	Def. value	Def. unit	FW vers.
EVM Peak (x3),		INV	–	V3.05
EVM RMS (x3),	For all measured values:	INV	–	
Magn Error Peak (x3),		INV	–	
Magn Error RMS (x3),		INV	–	
Phase Error Peak (x3),	NMAU | NMAL | INV | OK	INV	–	
Phase Error RMS (x3),		INV	–	
Overv. CarrierFeedth (x3),		INV	–	
Overv. I/Q Imbalance (x3),		INV	–	
Overv. Carr Freq Error (x3),		INV	–	
Overv. Tx Time Error (x3),		INV	–	
Overv. WFM Quality (x3),		INV	–	
Overv. MS Power (x3)		INV	–	

Description of command	Sig. State
This command is always a query. It indicates whether and in which way the error limits for the scalar measured values (see above command) have been exceeded. The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average*, and the *MMax* value. The following messages may be output for all measured values:	All

NMAU	Underflow of tolerance value	*not matching, underflow*
NMAL	Tolerance value exceeded	*not matching, overflow*
INV	Measurement invalid	*invalid*
OK	all tolerances matched	

MODulation:EVMagnitude

The subsystem *MODulation:EVMagnitude* measures the error vector magnitude as well as general scalar modulation parameters. The subsystem corresponds to the measurement menu *Modulation,* application *EVM O-QPSK* (*H-PSK*), and the associated popup menu *Modulation Configuration.*

Control of Measurement – Subsystem MODulation:EVMagnitude

The subsystem *MODulation:EVMagnitude* controls the modulation measurement. It corresponds to the softkey *EVM O-QPSK* (*H-PSK*) in the measurement menu *Modulation*.

Note: *The modulation scheme reference O-QPSK is optional in the commands to remain compatible with cdmaOne. O-QPSK supports radio configurations 1 and 2. H-PSK supports radio configurations 3 and 4.*

INITiate:MODulation:EVMagnitude[:OQPSk]	Start new measurement	⇒	*RUN*
ABORt:MODulation:EVMagnitude[:OQPSk]	Abort running measurement and switch off	⇒	*OFF*
STOP:MODulation:EVMagnitude[:OQPSk]	Stop measurement after current stat. cycle	⇒	*STOP*
CONTinue:MODulation:EVMagnitude[:OQPSk]	Next measurement step (*stepping mode*)	⇒	*RUN*
INITiate:MODulation:EVMagnitude:HPSK	Start new measurement	⇒	*RUN*
ABORt:MODulation:EVMagnitude:HPSK	Abort running measurement and switch off	⇒	*OFF*
STOP:MODulation:EVMagnitude:HPSK	Stop measurement after current stat. cycle	⇒	*STOP*
CONTinue:MODulation:EVMagnitude:HPSK	Next measurement step (*stepping mode*)	⇒	*RUN*

Description of command	Sig. State	FW vers.
These commands have no query form. They start and stop the modulation measurement, setting it to the status indicated in the top right column.	All	V3.05

CONFigure:MODulation:EVMagnitude[:OQPSk]:EREPorting[?] Event Reporting
CONFigure:MODulation:EVMagnitude:HPSK:EREPorting[?]
<Report Mode>

<Report Mode>	Description of parameters	Def. value	Def. unit	FW vers.
SRQ |	Service request	OFF	–	V3.05
SOPC |	Single operation complete			
SRSQ |	SRQ and SOPC			
OFF |	No reporting			
DEFault	Sets the value to the default setting			

Description of command	Sig. State
This command defines the events generated when the measurement is terminated or stopped (see *Event Reporting* in Chapter 5 of the CMU manual).	All

FETCh[:SCALar]:MODulation:EVMagnitude[:OQPSk]:STATus? Measurement Status
FETCh[:SCALar]:MODulation:EVMagnitude:HPSK:STATus?

Returned values	Description of parameters	Def. value	Def. unit	FW vers.
OFF |	Measurement in the OFF state (*RST or ABORt)	OFF	–	V3.05
RUN |	Running (after INITiate, CONTinue or READ)			
STOP |	Stopped (STOP)			
ERR |	OFF (could not be started)			
STEP |	Stepping mode (<stepmode>=STEP)			
RDY	Stopped according to repetition mode and stop condition			
1 to 10000 |	Counter for current statistics cycle	NONE	–	
NONE	No counting mode set			
1 to 1000	Counter for current evaluation period within a cycle	NONE	–	
NONE	Statistic count set to off			

Description of command	Sig. State
This command is always a query. It returns the status of the measurement (see Chapters 3 and 5).	All

Subsystem MODulation:EVMagnitude:CONTrol

The subsystem *MODulation:EVMagnitude:CONTrol* configures the modulation measurement. It corresponds to the tabs *Control* and *Statistics* in the popup menu *Modulation Configuration.*

Note: *The modulation scheme reference O-QPSK is optional in the commands to remain compatible with cdmaOne. O-QPSK supports radio configurations 1 and 2. H-PSK supports radio configurations 3 and 4.*

CONFigure:MODulation:EVMagnitude[:OQPSk]:CONTrol[?] Scope of Measurement
CONFigure:MODulation:EVMagnitude:HPSK:CONTrol[?]
<Statistics Count>, <Repetition>, <Stop Cond>, <Step Mode>

<Result Mode>	Description of parameters	Def. value	Def. unit	
SCALar |	Scalar values only (incl. ramp matching)	ARR	–	
ARRay,	Scalar measured values and arrays			
<Statistics Count>	Description of parameters	Def. value	Def. unit	
1 to 1000,	Number of bursts per statistics cycle	100	–	
<Repetition>	Description of parameters	Def. value	Def. unit	
1 to 10000 |	Multiple measurement (counting, until Status = STEP | RDY)	SING	–	
CONTinuous |	Continuous measurement (until STOP or ABORT)			
SINGleshot |	Single shot measurement (until Status = RDY)			
DEFault,	Sets the value to the default setting			
<Stop Cond>	Description of parameters	Def. value	Def. unit	
NONE |	Continue measurement even in case of error	NONE	–	
SONerror |	Stop measurement in case of error *(stop on error)*			
DEFault,	Sets the value to the default setting			
<Step Mode>	Description of parameters	Def. value	Def. unit	FW-Vers.
STEP |	Interrupt measurement after each statistics cycle	NONE	–	V3.05
NONE |	Continue measurement according to its rep. mode			
DEFault	Sets the value to the default setting			
Description of command				Sig. State
This command combines the ....CONTrol:STATistics and ...CONTrol:REPetition commands, see below.				All

CONFigure:MODulation:EVMagnitude[:OQPSk]:CONTrol:RMODe[?] Result mode
CONFigure:MODulation:EVMagnitude:HPSK:CONTrol:RMODe[?]
<Result Mode>

<Result Mode>	Description of parameters	Def. value	Def. unit	FW-Vers.
SCALar |	Scalar values only (incl. ramp matching)	ARR	–	V3.05
ARRay	Scalar measured values and arrays			
Description of command				Sig. State
This command specifies the type of measured values.				All

CONFigure:MODulation:EVMagnitude[:OQPSk]:CONTrol:STATistics[?] Statistics Count
CONFigure:MODulation:EVMagnitude:HPSK:CONTrol:STATistics[?]
<Statistics Count>

<Statistics Count>	Description of parameters	Def. value	Def. unit	FW-Vers.
1 to 1000	Number of bursts per statistics cycle	100	–	V3.05

Description of command	Sig. State
This command specifies the type of measured values and defines the number of bursts forming a statistics cycle.	All

CONFigure:MODulation:EVMagnitude[:OQPSk]:CONTrol:REPetition[?] Test Cycles
CONFigure:MODulation:EVMagnitude:HPSK:CONTrol:REPetition[?]
<Repetition> ,<Stop Cond>, <Step Mode>

<Repetition>	Description of parameters	Def. value	Def. unit	
1 to 10000 |	Multiple measurement (counting, until Status = STEP | RDY)	SING	–	
CONTinuous |	Continuous measurement (until STOP or ABORT)			
SINGleshot |	Single shot measurement (until Status = RDY)			
DEFault,	Sets the value to the default setting			
<Stop Cond>	Description of parameters	Def. value	Def. unit	
NONE |	Continue measurement even in case of error	NONE	–	
SONerror |	Stop measurement in case of error *(stop on error)*			
DEFault,	Sets the value to the default setting			
<Step Mode>	Description of parameters	Def. value	Def. unit	FW vers.
STEP |	Interrupt measurement after each statistics cycle	NONE	–	V3.05
NONE |	Continue measurement according to its rep. mode			
DEFault	Sets the value to the default setting			

Description of command	Sig. State
This command determines the repetition mode, stop condition, and stepping mode for the measurement. ***Note:*** *In the case of READ commands (`READ:...`), the <Repetition> parameter has no effect; the measurement is always stopped after a single shot.*	All

Subsystem SUBarrays:MODulation:EVMagnitude

The subsystem *SUBarrays:MODulation* defines the measurement range and the type of output values.

CONFigure:SUBarrays:MODulation:EVMagnitude[:OQPSk][?] **CONFigure:SUBarrays:MODulation:EVMagnitude:HPSK[?]** ***<Mode>*, *<Start>*, *<Samples>***				Definition of Subarrays
<Mode>	Description of parameters	Def. value	Def. unit	
ALL |	Return all measurement values	ALL	–	
ARIThmetical |	Return arithm. mean value in every range			
MINimum |	Return minimum value in every range			
MAXimum	Return maximum value in every range			
<Start>	Description of parameters	Def. value	Def. unit	
0 µs to 406 µs	Start time in current range	NAN	s	
<Samples>	Description of parameters	Def. value	Def. unit	FW vers.
0 to 500	Number of samples in current range	NAN	–	V3.05
Description of command				Sig. State
This command configures the `READ:SUBarrays...`, `FETCh:SUBarrays...`, and `SAMPle:SUBarrays:MODulation:EVMagnitude` commands. It restricts the measurement to up to 32 subranges where either all measurement results (the number of which is given by the second numerical parameter) or a single statistical value is returned. The subranges are defined by the start time and the number of test points which are located on a fixed, equidistant grid with a step width of 1 symbol period. The subranges may overlap but must be within the total range of the *Modulation* measurement. Test points outside this range are not measured (result *NAN)* and do not enter into the ARIThmetical, MINimum and MAXimum values. By default, only one range corresponding to the total measurement range is used and all measurement values are returned.				All

Measured Values – Subsystem MODulation:EVMagnitude

The subsystem *MODulation:EVMagnitude* measures and returns the modulation parameters and compares them with the tolerance values. The subsystem corresponds to the various output elements in the measurement menu *MODulation,* application *Error Vector Magnitude.*

Note: *The modulation scheme reference O-QPSK is optional in the commands to remain compatible with cdmaOne. O-QPSK supports radio configurations 1 and 2. H-PSK supports radio configurations 3 and 4.*

Scalar Results

READ[:SCALar]:MODulation:EVMagnitude[:OQPSk]? Start single shot measurement and return results

FETCh[:SCALar]:MODulation:EVMagnitude[:OQPSk]? Read out meas. results (unsynchronized)
SAMPle[:SCALar]:MODulation:EVMagnitude[:OQPSk]? Read out measurement results (synchronized)

READ[:SCALar]:MODulation:EVMagnitude:HPSK? Start single shot measurement and return results

FETCh[:SCALar]:MODulation:EVMagnitude:HPSK? Read out meas. results (unsynchronized)
SAMPle[:SCALar]:MODulation:EVMagnitude:HPSK? Read out measurement results (synchronized)

Returned values	Value range	Def. value	Def. unit	FW vers.
EVM Peak (x3)	0.0 % to 100.0 %	NAN	%	V3.05
EVM RMS (x3),	0.0 % to 100.0 %	NAN	%	
EVM Carrier Feedth (x3),	–120.0 dB to -20.0 dB	NAN	dB	
EVM I/Q Imbalance (x3),	–120.0 dB to -20.0 dB (QPSK only)	NAN	dB	
EVM Carr Freq Error (x3),	0 Hz to 1000 Hz	NAN	Hz	
EVM Tx Time Error (x3),	0 µs to 10 µs	NAN	µs	
EVM Waveform Quality (x3),	0 to 1	NAN	–	
EVM MS Power (x3),	–133.0 dBm to +–19.0 dBm	NAN	dB	
EVM Current Statistics	1 to 1000	NAN	–	
EVM Limit Matching	0.0 % to 100.0 %	NAN	%	

Description of command	Sig. State
These commands are always queries. They start a modulation measurement and output the scalar measurement results (see Chapter 4). The calculation of results in an *average* or *peak* measurement is described in Chapter 3 (see *calculation of statistical quantities*). The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average*, and the *MMax* value.	All

CALCulate[:SCALar]:MODulation:EVMagnitude[:OQPSk]:MATChing:LIMit? Out of Tolerance
CALCulate[:SCALar]:MODulation:EVMagnitude:HPSK:MATChing:LIMit?

Returned values	Value range	Def. value	Def. unit	FW vers.
EVM Peak (x3),	For all measured values:	INV	–	V3.05
EVM RMS (x3)		INV	–	
EVM Carrier Feedth (x3),	NMAU | NMAL | INV | OK	INV	–	
EVM I/Q Imbalance (x3),		INV	–	
EVM Carr Freq Error (x3),		INV	–	
EVM Tx Time Error (x3),		INV	–	
EVM WFM Quality (x3),		INV	–	
EVM MS Power (x3)		INV	–	

Description of command	Sig. State
This command is always a query. It indicates whether and in which way the error limits for the scalar measured values (see above command) have been exceeded. The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average*, and the *MMax* value. The limits are defined with the `CONFigure:MODulation:OEMP...` commands. The following messages may be output for all measured values:	All

NMAU	Underflow of tolerance value	*not matching, underflow*
NMAL	Tolerance value exceeded	*not matching, overflow*
INV	Measurement invalid	*invalid*
OK	all tolerances matched	

EVM in Evaluation Period

READ:ARRay:MODulation:EVMagnitude[:OQPSk]:CURRent?
READ:ARRay:MODulation:EVMagnitude[:OQPSk]:AVERage?
READ:ARRay:MODulation:EVMagnitude[:OQPSk]:MMAX?

Start single shot measurement and return results

FETCh:ARRay:MODulation:EVMagnitude[:OQPSk]:CURRent?
FETCh:ARRay:MODulation:EVMagnitude[:OQPSk]:AVERage?
FETCh:ARRay:MODulation:EVMagnitude[:OQPSk]:MMAX?

Read measurement results (unsynchronized)

SAMPle:ARRay:MODulation:EVMagnitude[:OQPSk]:CURRent?
SAMPle:ARRay:MODulation:EVMagnitude[:OQPSk]:AVERage?
SAMPle:ARRay:MODulation:EVMagnitude[:OQPSk]:MMAX?

Read measurement results (synchronized)

READ:ARRay:MODulation:EVMagnitude:HPSK:CURRent?
READ:ARRay:MODulation:EVMagnitude:HPSK:AVERage?
READ:ARRay:MODulation:EVMagnitude:HPSK:MMAX?

Start single shot measurement and return results

FETCh:ARRay:MODulation:EVMagnitude:HPSK:CURRent?
FETCh:ARRay:MODulation:EVMagnitude:HPSK:AVERage?
FETCh:ARRay:MODulation:EVMagnitude:HPSK:MMAX?

Read measurement results (unsynchronized)

SAMPle:ARRay:MODulation:EVMagnitude:HPSK:CURRent?
SAMPle:ARRay:MODulation:EVMagnitude:HPSK:AVERage?
SAMPle:ARRay:MODulation:EVMagnitude:HPSK:MMAX?

Read measurement results (synchronized)

Returned values	Value range	Def. value	Def. unit	FW vers.
1st value for error vector magnitude,	0.0 % to + 100.0 %,	NAN	%	V3.05
xth value for error vector magnitude	0.0 % to + 100.0 %	NAN	%	

Description of command	Sig. State
These commands are always queries. They return the error vector magnitude vs. time at fixed, equidistant test points. The number of measured values is 500, corresponding to a time range of 0 symbols to 406 microseconds. The calculation of *current, average, and mmax* (Min./Max.) results is explained in Chapter 3 (see *display mode*).	All

Subarray Results

READ:SUBarrays:MODulation:EVMagnitude[:OQPSk]:CURRent?
READ:SUBarrays:MODulation:EVMagnitude[:OQPSk]:AVERage?
READ:SUBarrays:MODulation:EVMagnitude[:OQPSk]:MMAX?
Start measurement and wait for end ⇒ RUN

FETCh:SUBarrays:MODulation:EVMagnitude[:OQPSk]:CURRent?
FETCh:SUBarrays:MODulation:EVMagnitude[:OQPSk]:AVERage?
FETCh:SUBarrays:MODulation:EVMagnitude[:OQPSk]:MMAX?
Read meas. results (unsynchronized) ⇒ RUN

SAMPle:SUBarrays:MODulation:EVMagnitude[:OQPSk]:CURRent?
SAMPle:SUBarrays:MODulation:EVMagnitude[:OQPSk]:AVERage?
SAMPle:SUBarrays:MODulation:EVMagnitude[:OQPSk]:MMAX?
Read results (synchronized) ⇒ RUN

READ:SUBarrays:MODulation:EVMagnitude:HPSK:CURRent?
READ:SUBarrays:MODulation:EVMagnitude:HPSK:AVERage?
READ:SUBarrays:MODulation:EVMagnitude:HPSK:MMAX?
Start measurement and wait for end ⇒ RUN

FETCh:SUBarrays:MODulation:EVMagnitude:HPSK:CURRent?
FETCh:SUBarrays:MODulation:EVMagnitude:HPSK:AVERage?
FETCh:SUBarrays:MODulation:EVMagnitude:HPSK:MMAX?
Read meas. results (unsynchronized) ⇒ RUN

SAMPle:SUBarrays:MODulation:EVMagnitude:HPSK:CURRent?
SAMPle:SUBarrays:MODulation:EVMagnitude:HPSK:AVERage?
SAMPle:SUBarrays:MODulation:EVMagnitude:HPSK:MMAX?
Read results (synchronized) ⇒ RUN

Returned values	Value range	Def. value	Def. unit	FW vers.
1st value for error vector magnitude	0.0 % to + 100.0 %,	NAN	%	V3.05
xth value for error vector magnitude	0.0 % to + 100.0 %	NAN	%	

Description of command	Sig. State
These commands are always queries. They measure and return the error vector magnitude versus time in the subranges defined by means of the `CONFigure:SUBarrays:MODulation:EVMagnitude` command. The `CONFigure:SUBarrays:MODulation:EVMagnitude` command defines a maximum of 32 subranges. If one of the statistical modes `(ARIThmetical, MINimum, MAXimum)` is set, only one value is returned per subrange. The calculation of *current, average, minimum,* and *maximum* results is explained in Chapter 3 (see *display mode*).	All

MODulation:PERRor

The subsystem *MODulation:PERRor* measures the phase error as well as general scalar modulation parameters. The subsystem corresponds to the measurement menu *Modulation,* application *Phase Error,* and the associated popup menu *Modulation Configuration.*

Control of Measurement – Subsystem MODulation:PERRor

The subsystem *MODulation:PERRor* controls the modulation measurement. It corresponds to the softkey *Phase Error* in the measurement menu *Modulation*.

Note: *The modulation scheme reference O-QPSK is optional in the commands to remain compatible with cdmaOne. O-QPSK supports radio configurations 1 and 2. H-PSK supports radio configurations 3 and 4.*

INITiate:MODulation:PERRor[:OQPSk]	Start new measurement	⇒ *RUN*
ABORt:MODulation:PERRor[:OQPSk]	Abort running measurement and switch off	⇒ *OFF*
STOP:MODulation:PERRor[:OQPSk]	Stop measurement after current stat. cycle	⇒ *STOP*
CONTinue:MODulation:PERRor[:OQPSk]	Next measurement step (*stepping mode*)	⇒ *RUN*
INITiate:MODulation:PERRor:HPSK	Start new measurement	⇒ *RUN*
ABORt:MODulation:PERRor:HPSK	Abort running measurement and switch off	⇒ *OFF*
STOP:MODulation:PERRor:HPSK	Stop measurement after current stat. cycle	⇒ *STOP*
CONTinue:MODulation:PERRor:HPSK	Next measurement step (*stepping mode*)	⇒ *RUN*

Description of command	Sig. State	FW vers.
These commands have no query form. They start and stop the modulation measurement, setting it to the status indicated in the top right column.	All	V3.05

CONFigure:MODulation:PERRor[:OQPSk]:EREPorting[?] Event Reporting
CONFigure:MODulation:PERRor:HPSK:EREPorting[?]
<Report Mode>

<Report Mode>	Description of parameters	Def. value	Def. unit	FW vers.
SRQ |	Service request	OFF	–	V3.05
SOPC |	Single operation complete			
SRSQ |	SRQ and SOPC			
OFF |	No reporting			
DEFault	Sets the value to the default setting			

Description of command	Sig. State
This command defines the events generated when the measurement is terminated or stopped (see *Event Reporting* in Chapter 5 of the CMU manual).	All

FETCh[:SCALar]:MODulation:PERRor[:OQPSk]:STATus?
FETCh[:SCALar]:MODulation:PERRor:HPSK:STATus?

Measurement Status

Return	Description of parameters	Def. value	Def. unit	FW vers.
OFF |	Measurement in the OFF state (*RST or ABORt)	OFF	–	V3.05
RUN |	Running (after INITiate, CONTinue or READ)			
STOP |	Stopped (STOP)			
ERR |	OFF (could not be started)			
STEP |	Stepping mode (<stepmode>=STEP)			
RDY	Stopped according to repetition mode and stop condition			
1 to 10000 |	Counter for current statistics cycle	NONE	–	
NONE	No counting mode set			
1 to 1000	Counter for current evaluation period within a cycle	NONE	–	
NONE	Statistic count set to off			

Description of command	Sig. State
This command is always a query. It returns the status of the measurement (see Chapters 3 and 5).	All

Subsystem MODulation:PERRor:CONTrol

The subsystem *MODulation:PERRor:CONTrol* configures the modulation measurement. It corresponds to the tabs *Control* and *Statistics* in the popup menu *Modulation Configuration*.

Note: *The modulation scheme reference O-QPSK is optional in the commands to remain compatible with cdmaOne. O-QPSK supports radio configurations 1 and 2. H-PSK supports radio configurations 3 and 4.*

CONFigure:MODulation:PERRor[:OQPSk]:CONTrol[?] Scope of Measurement
CONFigure:MODulation:PERRor:HPSK:CONTrol[?]
<Result Mode>, <Statistics Count>, <Repetition>, <Stop Cond>, <Step Mode>

<Result Mode>	Description of parameters	Def. value	Def. unit	
SCALar |	Scalar values only (incl. ramp matching)	ARR	–	
ARRay,	Scalar measured values and arrays			
<Statistics Count>	Description of parameters	Def. value	Def. unit	
1 to 1000,	Number of bursts per statistics cycle	100	–	
<Repetition>	Description of parameters	Def. value	Def. unit	
1 to 10000 |	Multiple measurement (counting, until Status = STEP | RDY)	SING	–	
CONTinuous |	Continuous measurement (until STOP or ABORT)			
SINGleshot |	Single shot measurement (until Status = RDY)			
DEFault,	Sets the value to the default setting			
<Stop Cond>	Description of parameters	Def. value	Def. unit	
NONE |	Continue measurement even in case of error	NONE	–	
SONerror |	Stop measurement in case of error *(stop on error)*			
DEFault,	Sets the value to the default setting			
<Step Mode>	Description of parameters	Def. value	Def. unit	FW-Vers.
STEP |	Interrupt measurement after each statistics cycle	NONE	–	V3.05
NONE |	Continue measurement according to its rep. Mode			
DEFault	Sets the value to the default setting			
Description of command				Sig. State
This command combines the `...CONTrol:STATistics`, `...CONTrol:REPetition and ...CONTrol:RMODe` commands.				All

CONFigure:MODulation:PERRor[:OQPSk]:CONTrol:STATistics[?] Statistics Count
CONFigure:MODulation:PERRor:HPSK:CONTrol:STATistics[?]
<Statistics Count>

<Statistics Count>	Description of parameters	Def. value	Def. unit	FW-Vers.
1 to 1000	Number of bursts per statistics cycle	100	–	V3.05
Description of command				Sig. State
This command specifies the type of measured values and defines the number of bursts forming a statistics cycle.				All

CONFigure:MODulation:PERRor[:OQPSk]:CONTrol:REPetition[?] Test Cycles
CONFigure:MODulation:PERRor:HPSK:CONTrol:REPetition[?]
<Repetition>, <Stop Cond>, <Step Mode>

<Repetition>	Description of parameters	Def. value	Def. unit	
1 to 10000 |	Multiple measurement (counting, until Status = STEP | RDY)	SING	–	
CONTinuous |	Continuous measurement (until STOP or ABORT)			
SINGleshot |	Single shot measurement (until Status = RDY)			
DEFault,	Sets the value to the default setting			
<Stop Cond>	**Description of parameters**	**Def. value**	**Def. unit**	
NONE |	Continue measurement even in case of error	NONE	–	
SONerror |	Stop measurement in case of error *(stop on error)*			
DEFault,	Sets the value to the default setting			
<Step Mode>	**Description of parameters**	**Def. value**	**Def. unit**	**FW vers.**
STEP |	Interrupt measurement after each statistics cycle	NONE	–	V3.05
NONE |	Continue measurement according to its rep. Mode			
DEFault	Sets the value to the default setting			

Description of command	Sig. State
This command determines the number of statistics cycles, the stop condition and the stepping mode for the measurement. **Note:** *In the case of READ commands (`READ:...`), the <Repetition> parameter has no effect; the measurement is always stopped after a single shot.*	All

CONFigure:MODulation:PERRor[:OQPSk]:CONTrol:RMODe[?] Result Mode
CONFigure:MODulation:PERRor:HPSK:CONTrol:RMODe[?]
<Result Mode>

<Result Mode>	Description of parameters	Def. value	Def. unit	FW-Vers.
SCALar |	Scalar values only (incl. ramp matching)	ARR	–	V3.05
ARRay	Scalar measured values and arrays			

Description of command	Sig. State
This command specifies the type of measured values.	All

Subsystem SUBarrays:MODulation:PERRor

The subsystem *SUBarrays:MODulation:PERRor* defines the measurement range and the type of output values.

Note: *The modulation scheme reference O-QPSK is optional in the commands to remain compatible with cdmaOne. O-QPSK supports radio configurations 1 and 2. H-PSK supports radio configurations 3 and 4.*

CONFigure:SUBarrays:MODulation:PERRor[:OQPSk][?]
CONFigure:SUBarrays:MODulation:PERRor:HPSK[?]
<Mode>*, *<Start>*, *<Samples>

Definition of Subarrays

<Mode>	Description of parameters	Def. value	Def. unit	
ALL | ARIThmetical | MINimum | MAXimum,	Return all measurement values Return arithm. mean value in every range Return minimum value in every range Return maximum value in every range	ALL	–	
<Start>	Description of parameters	Def. value	Def. unit	
0 µs to 406 µs,	Start time in current range	NAN	s	
<Samples>	Description of parameters	Def. value	Def. unit	FW vers.
0 to 500	Number of samples in current range	NAN	–	V3.05

Description of command	Sig. State
This command configures the `READ:SUBarrays...`, `FETCh:SUBarrays...`, and `SAMPle:SUBarrays:MODulation:PERRor` commands. It restricts the measurement to up to 32 subranges where either all measurement results (the number of which is given by the second numerical parameter) or a single statistical value is returned. The subranges are defined by the start time and the number of test points which are located on a fixed, equidistant grid with a step width of 1 symbol period. The subranges may overlap but must be within the total range of the *Modulation* measurement. Test points outside this range are not measured (result *NAN)* and do not enter into the ARIThmetical, MINimum and MAXimum values. By default, only one range corresponding to the total measurement range is used and all measurement values are returned.	All

Measured Values – Subsystem MODulation:PERRor

The subsystem *MODulation:PERRor* measures and returns the modulation parameters and compares them with the tolerance values. The subsystem corresponds to the various output elements in the measurement menu *MODulation,* application *Phase Error.*

Note: *The modulation scheme reference O-QPSK is optional in the commands to remain compatible with cdmaOne. O-QPSK supports radio configurations 1 and 2. H-PSK supports radio configurations 3 and 4.*

Scalar Results:

READ[:SCALar]:MODulation:PERRor[:OQPSk]? Start single shot measurement and return results
FETCh[:SCALar]:MODulation:PERRor[:OQPSk]?Read out meas. results (unsynchronized)

SAMPle[:SCALar]:MODulation:PERRor[:OQPSk]?Read out measurement results (synchronized)

READ[:SCALar]:MODulation:PERRor:HPSK? Start single shot measurement and return results
FETCh[:SCALar]:MODulation:PERRor:HPSK?Read out meas. results (unsynchronized)

SAMPle[:SCALar]:MODulation:PERRor:HPSK? Read out measurement results (synchronized)

Returned values	Value range	Def. value	Def. unit	FW vers.
PE Peak (x3),	0.0 deg to +45.0 deg	NAN	%	V3.05
PE RMS (x3),	0.0 deg to +45.0 deg	NAN	%	
PE Carrier Feedth (x3),	–120.0 dB to -20.0 dB	NAN	dB	
PE I/Q Imbalance (x3),	–120.0 dB to -20.0 dB (QPSK only)	NAN	dB	
PE Carr Freq Error (x3),	0 Hz to 1000 Hz	NAN	Hz	
PE Tx Time Error (x3),	0 µs to 10 µs	NAN	µs	
PE WFM Quality (x3),	0 to 1	NAN	–	
PE MS Power (x3),	–133.0 dBm to +–19.0 dBm	NAN	dBm	
PE Current Statistics	1 to 1000	NAN	–	
PE Limit Matching	0.0 % to 100.0 %	NAN	%	

Description of command	Sig. State
These commands are always queries. They start a modulation measurement and output the scalar measurement results (see Chapter 4). The calculation of results in an *average* or *peak* measurement is described in Chapter 3 (see *calculation of statistical quantities*). The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average,* and the *MMax* value.	All

CALCulate[:SCALar]:MODulation:PERRor[:OQPSk]:MATChing:LIMit? Out of Tolerance
CALCulate[:SCALar]:MODulation:PERRor:HPSK:MATChing:LIMit?.

Returned values	Value range	Def. value	Def. unit	FW vers.
PE Peak (x3),	For all measured values:	INV	–	V3.05
PE RMS (x3)		INV	–	
PE CarrierFeedth (x3),	NMAU | NMAL | INV | OK	INV	–	
PE I/Q Imbalance (x3),		INV	–	
PE Carr Freq Error (x3),		INV	–	
PE Tx Time Error (x3),		INV	–	
PE WFM Quality (x3),		INV	–	
PE MS Power (x3)		INV	–	

Description of command	Sig. State
This command is always a query. It indicates whether and in which way the error limits for the scalar measured values (see above command) have been exceeded. The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average,* and the *MMax* value. The limits are defined with the `CONFigure:MODulation:OEMP...` commands.	All

The following messages may be output for all measured values:

NMAU	Underflow of tolerance value	*not matching, underflow*
NMAL	Tolerance value exceeded	*not matching, overflow*
INV	Measurement invalid	*invalid*
OK	all tolerances matched	

Phase Error in Burst

Command	Description
READ:ARRay:MODulation:PERRor[:OQPSk]:CURRent? **READ:ARRay:MODulation:PERRor[:OQPSk]:AVERage?** **READ:ARRay:MODulation:PERRor[:OQPSk]:MMAX?**	Start single shot measurement and return results
FETCh:ARRay:MODulation:PERRor[:OQPSk]:CURRent? **FETCh:ARRay:MODulation:PERRor[:OQPSk]:AVERage?** **FETCh:ARRay:MODulation:PERRor[:OQPSk]:MMAX?**	Read measurement results (unsynchronized)
SAMPle:ARRay:MODulation:PERRor[:OQPSk]:CURRent? **SAMPle:ARRay:MODulation:PERRor[:OQPSk]:AVERage?** **SAMPle:ARRay:MODulation:PERRor[:OQPSk]:MMAX?**	Read measurement results (synchronized)
READ:ARRay:MODulation:PERRor:HPSK:CURRent? **READ:ARRay:MODulation:PERRor:HPSK:AVERage?** **READ:ARRay:MODulation:PERRor:HPSK:MMAX?**	Start single shot measurement and return results
FETCh:ARRay:MODulation:PERRor:HPSK:CURRent? **FETCh:ARRay:MODulation:PERRor:HPSK:AVERage?** **FETCh:ARRay:MODulation:PERRor:HPSK:MMAX?**	Read measurement results (unsynchronized)
SAMPle:ARRay:MODulation:PERRor:HPSK:CURRent? **SAMPle:ARRay:MODulation:PERRor:HPSK:AVERage?** **SAMPle:ARRay:MODulation:PERRor:HPSK:MMAX?**	Read measurement results (synchronized)

Returned values	Value range	Def. value	Def. unit	FW vers.
1st value for phase error	–100.0 deg to + 100.0 deg,	NAN	deg	V3.05
xth value for phase error	–100.0 deg to + 100.0 deg	NAN	deg	

Description of command	Sig. State
These commands are always queries. They return the phase error vs. time at fixed, equidistant test points. The number of measured values is 500, corresponding to a time range of 0 symbols to 406 microseconds. The calculation of *current, average, and mmax* (Min./Max.) results is explained in Chapter 3 (see *display mode*).	All

Subarray Results

READ:SUBarrays:MODulation:PERRor[:OQPSk]:CURRent?
READ:SUBarrays:MODulation:PERRor[:OQPSk]:AVERage?
READ:SUBarrays:MODulation:PERRor[:OQPSk]:MMAX?

Start measurement and wait for end ⇒ RUN

FETCh:SUBarrays:MODulation:PERRor[:OQPSk]:CURRent?
FETCh:SUBarrays:MODulation:PERRor[:OQPSk]:AVERage?
FETCh:SUBarrays:MODulation:PERRor[:OQPSk]:MMAX?

Read meas. results (unsynchronized) ⇒ RUN

SAMPle:SUBarrays:MODulation:PERRor[:OQPSk]:CURRent?
SAMPle:SUBarrays:MODulation:PERRor[:OQPSk]:AVERage?
SAMPle:SUBarrays:MODulation:PERRor[:OQPSk]:MMAX?

Read results (synchronized) ⇒ RUN

READ:SUBarrays:MODulation:PERRor:HPSK:CURRent?
READ:SUBarrays:MODulation:PERRor:HPSK:AVERage?
READ:SUBarrays:MODulation:PERRor:HPSK:MMAX?

Start measurement and wait for end ⇒ RUN

FETCh:SUBarrays:MODulation:PERRor:HPSK:CURRent?
FETCh:SUBarrays:MODulation:PERRor:HPSK:AVERage?
FETCh:SUBarrays:MODulation:PERRor:HPSK:MMAX?

Read meas. results (unsynchronized) ⇒ RUN

SAMPle:SUBarrays:MODulation:PERRor:HPSK:CURRent?
SAMPle:SUBarrays:MODulation:PERRor:HPSK:AVERage?
SAMPle:SUBarrays:MODulation:PERRor:HPSK:MMAX?

Read results (synchronized) ⇒ RUN

Returned values	Value range	Def. value	Def. unit	FW vers.
1st value for phase error	100.0 deg to + 100.0 deg,	NAN	deg	V3.05
xth value for phase error	–100.0 deg to + 100.0 deg	NAN	deg	

Description of command	Sig. State
These commands are always queries. They measure and return the phase error versus time in the subranges defined by means of the `CONFigure:SUBarrays:MODulation:PERRor` command. The `CONFigure:SUBarrays:MODulation:PERRor` command defines a maximum of 32 subranges. If one of the statistical modes `(ARIThmetical, MINimum, MAXimum)` is set, only one value is returned per subrange. The calculation of *current, average, minimum,* and *maximum* results is explained in Chapter 3 (see *display mode*).	All

MODulation:MERRor

The subsystem *MODulation:MERRor* measures the magnitude error as well as general scalar modulation parameters. The subsystem corresponds to the measurement menu *Modulation,* application *Magnitude Error,* and the associated popup menu *Modulation Configuration.*

Control of Measurement – Subsystem MODulation:MERRor

The subsystem *MODulation:MERRor* controls the modulation measurement. It corresponds to the softkey *Magn. Error* in the measurement menu *Modulation.*

Note: *The modulation scheme reference O-QPSK is optional in the commands to remain compatible with cdmaOne. O-QPSK supports radio configurations 1 and 2. H-PSK supports radio configurations 3 and 4.*

INITiate:MODulation:MERRor[:OQPSk]	Start new measurement	⇒ *RUN*
ABORt:MODulation:MERRor[:OQPSk]	Abort running measurement and switch off	⇒ *OFF*
STOP:MODulation:MERRor[:OQPSk]	Stop measurement after current stat. cycle	⇒ *STOP*
CONTinue:MODulation:MERRor[:OQPSk]	Next measurement step (*stepping mode*)	⇒ *RUN*
INITiate:MODulation:MERRor:HPSK	Start new measurement	⇒ *RUN*
ABORt:MODulation:MERRor:HPSK	Abort running measurement and switch off	⇒ *OFF*
STOP:MODulation:MERRor:HPSK	Stop measurement after current stat. cycle	⇒ *STOP*
CONTinue:MODulation:MERRor:HPSK	Next measurement step (*stepping mode*)	⇒ *RUN*

Description of command	Sig. State	FW vers.
These commands have no query form. They start and stop the modulation measurement, setting it to the status indicated in the top right column.	All	V3.05

CONFigure:MODulation:MERRor[:OQPSk]:EREPorting[?] Event Reporting
CONFigure:MODulation:MERRor:HPSK:EREPorting[?]
<Report Mode>

<Report Mode>	Description of parameters	Def. value	Def. unit	FW vers.
SRQ |	Service request	OFF	–	V3.05
SOPC |	Single operation complete			
SRSQ |	SRQ and SOPC			
OFF |	No reporting			
DEFault	Sets the value to the default setting			

Description of command	Sig. State
This command defines the events generated when the measurement is terminated or stopped (see *Event Reporting* in Chapter 5 of the CMU manual).	All

FETCh[:SCALar]:MODulation:MERRor[:OQPSk]:STATus? **FETCh[:SCALar]:MODulation:MERRor:HPSK:STATus?**				Measurement Status
Return	**Description of parameters**	**Def. value**	**Def. unit**	**FW vers.**
OFF | RUN | STOP | ERR | STEP | RDY	Measurement in the OFF state (*RST or ABORt) Running (after INITiate, CONTinue or READ) Stopped (STOP) OFF (could not be started) Stepping mode (<stepmode>=STEP) Stopped according to repetition mode and stop condition	OFF	–	V3.05
1 to 10000 | NONE	Counter for current statistics cycle No counting mode set	NONE	–	
1 to 1000 NONE	Counter for current evaluation period within a cycle Statistic count set to off	NONE	–	
Description of command				**Sig. State**
This command is always a query. It returns the status of the measurement (see Chapters 3 and 5).				All

Subsystem MODulation:MERRor:CONTrol

The subsystem *MODulation:MERRor:CONTrol* configures the modulation measurement. It corresponds to the tabs *Control* and *Limits* in the popup menu *Modulation Configuration*.

Note: *The modulation scheme reference O-QPSK is optional in the commands to remain compatible with cdmaOne. O-QPSK supports radio configurations 1 and 2. H-PSK supports radio configurations 3 and 4.*

CONFigure:MODulation:MERRor[:OQPSk]:CONTrol[?] Scope of Measurement
CONFigure:MODulation:MERRor:HPSK:CONTrol[?]
<Result Mode>, <Statistics Count>, <Repetition>, <Stop Cond>, <Step Mode>

<Result Mode>	Description of parameters	Def. value	Def. unit	
SCALar | ARRay,	Scalar values only (incl. ramp matching) Scalar measured values and arrays	ARR	–	
<Statistics Count>	Description of parameters	Def. value	Def. unit	
1 to 1000,	Number of bursts per statistics cycle	100	–	
<Repetition>	Description of parameters	Def. value	Def. unit	
1 to 10000 | CONTinuous | SINGleshot | DEFault,	Multiple measurement (counting, until Status = STEP | RDY) Continuous measurement (until STOP or ABORT) Single shot measurement (until Status = RDY) Sets the value to the default setting	SING	–	
<Stop Cond>	Description of parameters	Def. value	Def. unit	
NONE | SONerror | DEFault,	Continue measurement even in case of error Stop measurement in case of error *(stop on error)* Sets the value to the default setting	NONE	–	
<Step Mode>	Description of parameters	Def. value	Def. unit	FW-Vers.
STEP | NONE | DEFault	Interrupt measurement after each statistics cycle Continue measurement according to its rep. Mode Sets the value to the default setting	NONE	–	V3.05
Description of command				Sig. State
This command combines the `....CONTrol:RMODe`, `....CONTrol:STATistics`, and `...CONTrol:REPetition` commands, see below.				All

CONFigure:MODulation:MERRor[:OQPSk]:CONTrol:RMODe[?] Result mode
CONFigure:MODulation:MERRor:HPSK:CONTrol:RMODe[?]
<Result Mode>

<Result Mode>	Description of parameters	Def. value	Def. unit	FW-Vers.
SCALar | ARRay	Scalar values only (incl. ramp matching) Scalar measured values and arrays	ARR	–	V3.05
Description of command				Sig. State
This command specifies the type of measured values.				All

CONFigure:MODulation:MERRor[:OQPSk]:CONTrol:STATistics[?] Statistics Count
CONFigure:MODulation:MERRor:HPSK:CONTrol:STATistics[?]
<Statistics Count>

<Statistics Count>	Description of parameters	Def. value	Def. unit	FW-Vers.
1 to 1000	Number of bursts per statistics cycle	100	–	V3.05
Description of command				Sig. State
This command specifies the type of measured values and defines the number of bursts forming a statistics cycle.				All

CONFigure:MODulation:MERRor[:OQPSk]:CONTrol:REPetition[?] Test Cycles
<Repetition>*, *<Stop Cond>*, *<Step Mode>

<Repetition>	Description of parameters	Def. value	Def. unit	
1 to 10000 |	Multiple measurement (counting, until Status = STEP | RDY)	SING	–	
CONTinuous |	Continuous measurement (until STOP or ABORT)			
SINGleshot |	Single shot measurement (until Status = RDY)			
DEFault,	Sets the value to the default setting			
<Stop Cond>	Description of parameters	Def. value	Def. unit	
NONE |	Continue measurement even in case of error	NONE	–	
SONerror |	Stop measurement in case of error *(stop on error)*			
DEFault,	Sets the value to the default setting			
<Step Mode>	Description of parameters	Def. value	Def. unit	FW vers.
STEP |	Interrupt measurement after each statistics cycle	NONE	–	V3.05
NONE |	Continue measurement according to its rep. Mode			
DEFault	Sets the value to the default setting			

Description of command	Sig. State
This command determines the repetition mode, stop condition, and stepping mode for the measurement. **Note:** *In the case of READ commands (`READ:...`), the <Repetition> parameter has no effect; the measurement is always stopped after a single shot.*	All

Subsystem SUBarrays:MODulation:MERRor

The subsystem *SUBarrays:MODulation:MERRor* defines the measurement range and the type of output values.

Note: *The modulation scheme reference O-QPSK is optional in the commands to remain compatible with cdmaOne. O-QPSK supports radio configurations 1 and 2. H-PSK supports radio configurations 3 and 4.*

CONFigure:SUBarrays:MODulation:MERRor[:OQPSk][?] Definition of Subarrays
CONFigure:SUBarrays:MODulation:MERRor:HPSK[?]
<Mode>*, *<Start>*, *<Samples>

<Mode>	Description of parameters	Def. value	Def. unit	
ALL | ARIThmetical | MINimum | MAXimum,	Return all measurement values Return arithm. mean value in every range Return minimum value in every range Return maximum value in every range	ALL	–	
<Start>	Description of parameters	Def. value	Def. unit	
0 µs to 406 µs,	Start time in current range	NAN	s	
<Samples>	Description of parameters	Def. value	Def. unit	FW vers.
0 to 500	Number of samples in current range	NAN	–	V3.05
Description of command				Sig. State
This command configures the `READ:SUBarrays...`, `FETCh:SUBarrays...`, and `SAMPle:SUBarrays:MODulation:MERRor` commands. It restricts the measurement to up to 32 subranges where either all measurement results (the number of which is given by the second numerical parameter) or a single statistical value is returned. The subranges are defined by the start time and the number of test points which are located on a fixed, equidistant grid with a step width of 1 symbol period. The subranges may overlap but must be within the total range of the *Modulation* measurement. Test points outside this range are not measured (result *NAN)* and do not enter into the ARIThmetical, MINimum and MAXimum values. By default, only one range corresponding to the total measurement range is used and all measurement values are returned.				All

Measured Values – Subsystem MODulation:MERRor

The subsystem *MODulation:MERRor* measures and returns the modulation parameters and compares them with the tolerance values. The subsystem corresponds to the various output elements in the measurement menu *MODulation,* application *Magnitude Error.*

Note: *The modulation scheme reference O-QPSK is optional in the commands to remain compatible with cdmaOne. O-QPSK supports radio configurations 1 and 2. H-PSK supports radio configurations 3 and 4.*

Scalar Results

READ[:SCALar]:MODulation:MERRor[:OQPSk]?Start single shot measurement and return results

FETCh[:SCALar]:MODulation:MERRor[:OQPSk]?Read out meas. results (unsynchronized)

SAMPle[:SCALar]:MODulation:MERRor[:OQPSk]?Read out measurement results (synchronized)

READ[:SCALar]:MODulation:MERRor:HPSK?Start single shot measurement and return results

FETCh[:SCALar]:MODulation:MERRor:HPSK?Read out meas. results (unsynchronized)

SAMPle[:SCALar]:MODulation:MERRor:HPSK?Read out measurement results (synchronized)

Returned values	Value range	Def. value	Def. unit	FW vers.
ME Peak (x3),	0.0 % to 100.0 %	NAN	%	V3.05
ME RMS (x3),	0.0 % to 100.0 %	NAN	%	
ME CarrierFeedthrough (x3),	–120.0 dB to -20.0 dB	NAN	dB	
ME I/Q Imbalance (x3),	–120.0 dB to -20.0 dB (QPSK only)	NAN	dB	
ME Carr Freq Error (x3),	0 Hz to 1000 Hz	NAN	Hz	
ME Transmit Time Error (x3),	0 µs to 10 µs	NAN	µs	
ME Waveform Quality (x3),	0 to 1	NAN	–	
ME MS Power (x3),	–133.0 dBm to +–19.0 dBm	NAN	dB	
ME Current Statistics	1 to 1000	NAN	–	
ME Limit Matching	0.0 % to 100.0 %	NAN	%	

Description of command	Sig. State
These commands are always queries. They start a modulation measurement and output the scalar measurement results (see Chapter 4). The calculation of results in an *average* or *peak* measurement is described in Chapter 3 (see *calculation of statistical quantities*). The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average,* and the *MaxMin* value.	All

CALCulate[:SCALar]:MODulation:MERRor[:OQPSk]:MATChing:LIMit?
CALCulate[:SCALar]:MODulation:MERRor:HPSK:MATChing:LIMit?

Out of Tolerance

Returned values	Value range	Def. value	Def. unit	FW vers.
ME Peak (x3),		INV	–	V3.05
ME RMS (x3),	For all measured values:	INV	–	
ME CarrierFeedthrough (x3),		INV	–	
ME I/Q Imbalance (x3),		INV	–	
ME Carr Freq Error (x3),	NMAU | NMAL | INV | OK	INV	–	
ME Transmit Time Error (x3),		INV	–	
ME Waveform Quality (x3),		INV	–	
ME MS Power (x3)		INV	–	

Description of command	Sig. State
This command is always a query. It indicates whether and in which way the error limits for the scalar measured values (see above command) have been exceeded. The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average,* and the *MaxMin* value. The limits are defined with the `CONFigure:MODulation:OEMP`... commands. The following messages may be output for all measured values:	All

NMAU	Underflow of tolerance value	*not matching, underflow*
NMAL	Tolerance value exceeded	*not matching, overflow*
INV	Measurement invalid	*invalid*
OK	all tolerances matched	

Magnitude Error in Evaluation Period

```
READ:ARRay:MODulation:MERRor[:OQPSk]:CURRent?
READ:ARRay:MODulation:MERRor[:OQPSk]:AVERage?
READ:ARRay:MODulation:MERRor[:OQPSk]:MMAX?
```

Start single shot measurement and return results

```
FETCh:ARRay:MODulation:MERRor[:OQPSk]:CURRent?
FETCh:ARRay:MODulation:MERRor[:OQPSk]:AVERage?
FETCh:ARRay:MODulation:MERRor[:OQPSk]:MMAX?
```

Read measurement results (unsynchronized)

```
SAMPle:ARRay:MODulation:MERRor[:OQPSk]:CURRent?
SAMPle:ARRay:MODulation:MERRor[:OQPSk]:AVERage?
SAMPle:ARRay:MODulation:MERRor[:OQPSk]:MMAX?
```

Read measurement results (synchronized)

```
READ:ARRay:MODulation:MERRor:HPSK:CURRent?
READ:ARRay:MODulation:MERRor:HPSK:AVERage?
READ:ARRay:MODulation:MERRor:HPSK:MMAX?
```

Start single shot measurement and return results

```
FETCh:ARRay:MODulation:MERRor:HPSK:CURRent?
FETCh:ARRay:MODulation:MERRor:HPSK:AVERage?
FETCh:ARRay:MODulation:MERRor:HPSK:MMAX?
```

Read measurement results (unsynchronized)

```
SAMPle:ARRay:MODulation:MERRor:HPSK:CURRent?
SAMPle:ARRay:MODulation:MERRor:HPSK:AVERage?
SAMPle:ARRay:MODulation:MERRor:HPSK:MMAX?
```

Read measurement results (synchronized)

Returned values	Value range	Def. value	Def. unit	FW vers.
1st value for magnitude error,	0.0 % to + 100.0 %,	NAN	%	V3.05
xth value for magnitude error	0.0 % to + 100.0 %	NAN	%	

Description of command	Sig. State
These commands are always queries. They return the magnitude error vs. time at fixed, equidistant test points. The number of measured values is 500, corresponding to a time range of 0 symbols to 406 microseconds. The calculation of *current, average, and mmax* (Min./Max.) results is explained in Chapter 3 (see *display mode*).	All

Subarray Results

READ:SUBarrays:MODulation:MERRor[:OQPSk]:CURRent?
READ:SUBarrays:MODulation:MERRor[:OQPSk]:AVERage?
READ:SUBarrays:MODulation:MERRor[:OQPSk]:MMAX?

Start measurement and wait for end ⇒ RUN

FETCh:SUBarrays:MODulation:MERRor[:OQPSk]:CURRent?
FETCh:SUBarrays:MODulation:MERRor[:OQPSk]:AVERage?
FETCh:SUBarrays:MODulation:MERRor[:OQPSk]:MMAX?

Read meas. results (unsynchronized) ⇒ RUN

SAMPle:SUBarrays:MODulation:MERRor[:OQPSk]:CURRent?
SAMPle:SUBarrays:MODulation:MERRor[:OQPSk]:AVERage?
SAMPle:SUBarrays:MODulation:MERRor[:OQPSk]:MMAX?

Read results (synchronized) ⇒ RUN

READ:SUBarrays:MODulation:MERRor:HPSK:CURRent?
READ:SUBarrays:MODulation:MERRor:HPSK:AVERage?
READ:SUBarrays:MODulation:MERRor:HPSK:MMAX?

Start measurement and wait for end ⇒ RUN

FETCh:SUBarrays:MODulation:MERRor:HPSK:CURRent?
FETCh:SUBarrays:MODulation:MERRor:HPSK:AVERage?
FETCh:SUBarrays:MODulation:MERRor:HPSK:MMAX?

Read meas. results (unsynchronized) ⇒ RUN

SAMPle:SUBarrays:MODulation:MERRor:HPSK:CURRent?
SAMPle:SUBarrays:MODulation:MERRor:HPSK:AVERage?
SAMPle:SUBarrays:MODulation:MERRor:HPSK:MMAX?

Read results (synchronized) ⇒ RUN

Returned values	Description of parameters	Def. value	Def. unit	FW vers.
1st value for magnitude error	0.0 % to + 100.0 %,	NAN	%	V3.05
xth value for magnitude error	0.0 % to + 100.0 %	NAN	%	

Description of command	Sig. State
These commands are always queries. They measure and return the magnitude error versus time in the subranges defined by means of the `CONFigure:SUBarrays:MODulation:MERRor` command. The `CONFigure:SUBarrays:MODulation:MERRor` command defines a maximum of 32 subranges. If one of the statistical modes `(ARIThmetical, MINimum, MAXimum)` is set, only one value is returned per subrange. The calculation of *current*, *average*, *minimum*, and *maximum* results is explained in Chapter 3 (see *display mode*).	All

SPECtrum:ACP (ACP Spectrum)

The subsystem *SPECtrum:ACP* measures the power of four adjacent channel pairs. These four pairs correspond to symmetrical frequency offsets to the RF frequency (command `[SENSe:]RFANalyzer:FREQuency[?]`). The subsystem corresponds to the measurement menu *Spectrum* and the associated popup menu *Spectrum Configuration*.

Control of Measurement

The subsystem *SPECtrum:ACP* controls the adjacent channel power spectrum measurement. It corresponds to the softkey *ACP* in the measurement menu *Spectrum*.

INITiate:SPECtrum:ACP	Start new measurement	⇒ *RUN*
ABORt:SPECtrum:ACP	Abort running measurement and switch off	⇒ *OFF*
STOP:SPECtrum:ACP	Stop measurement after current stat. cycle	⇒ *STOP*
CONTinue:SPECtrum:ACP	Next measurement step (*stepping mode*)	⇒ *RUN*

Description of command	FW vers.
These commands have no query form. They start and stop the ACP spectrum measurement, setting it to the status indicated in the top right column.	V3.40

CONFigure:SPECtrum:ACP:EREPorting[?] ***<Report Mode>*** Event Reporting

<Report Mode>	Description of parameters	Def. value	Def. unit	FW vers.
SRQ |	Service request	OFF	–	V3.40
SOPC |	Single operation complete			
SRSQ |	SRQ and SOPC			
DEFault |	Sets the value to the default setting			
OFF	No reporting			

Description of command

This command defines the events generated when the measurement is terminated or stopped (see *Event Reporting* in Chapter 5 of the CMU manual).

FETCh[:SCALar]:SPECtrum:ACP:STATus? Measurement Status

Return	Description of parameters	Def. value	Def. unit	FW vers.
OFF |	Measurement in the OFF state (*RST or ABORt)	OFF	–	V3.40
RUN |	Running (after INITiate, CONTinue or READ)			
STOP |	Stopped (STOP)			
ERR |	OFF (could not be started)			
STEP |	Stepping mode (<stepmode>=STEP)			
RDY	Stopped according to repetition mode and stop condition			
1 to 10000 |	Counter for current statistics cycle	NONE	–	
NONE	No counting mode set			
1 to 1000	Counter for current evaluation period within a cycle	NONE	–	
NONE	Statistic count set to off			

Description of command

This command is always a query. It returns the status of the measurement (see Chapters 3 and 5).

Test Configuration

The commands of the following subsystems configure the *ACP Spectrum* measurement in the *Spectrum* menu. They correspond to the *Spectrum Configuration popup* menu.

Subsystem CONTrol

The subsystem *SPECtrum:ACP:CONTrol* configures the ACP Spectrum measurement. It defines the repetition mode, statistic count, stop condition and the offset frequencies of the measurement. It corresponds to the tab *Control* in the popup menu *Spectrum Configuration*.

CONFigure:SPECtrum:ACP:CONTrol[?] Scope of Measurement
<Current Statistics>, <Repetition>, <Stop Cond>, <Step Mode>

<Current Statistics>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 1000,	Number of bursts per statistics cycle	100	–	V3.40
<Repetition>	**Description of parameters**	**Def. value**	**Def. unit**	**FW vers.**
1 to 10000 | **CONTinuous |** **SINGleshot |** **DEFault,**	Multiple measurement (*counting*, until `Status = STEP | RDY`) Continuous measurement (until `STOP` or `ABORT`) Single shot measurement (until `Status = RDY`) Sets the value to the default setting	SING	–	V3.40
<Stop Cond>	**Description of parameters**	**Def. value**	**Def. unit**	**FW vers.**
NONE | **SONerror |** **DEFault,**	Continue measurement even in case of error Stop measurement in case of error *(stop on error)* Sets the value to the default setting	NONE	–	V3.40
<Step Mode>	**Description of parameters**	**Def. value**	**Def. unit**	**FW vers.**
STEP | **NONE |** **DEFault**	Interrupt measurement after each statistics cycle Continue measurement according to its rep. Mode Sets the value to the default setting	NONE	–	V3.40

Description of command

This command combines the `...CONTrol:RMODe`, `...CONTrol:STATistics` and the `...CONTrol:REPetition` commands, see below.

CONFigure:SPECtrum:ACP:CONTrol:STATistics[?] Statistic Count
<Current Statistics >

<Statistics Count>	Description of parameters	Def. value	Def. unit	FW-Vers.
1 to 1000	Number of bursts per statistics cycle	100	–	V3.40

Description of command

This command defines the number of bursts forming a statistics cycle.

CONFigure:SPECtrum:ACP:CONTrol:REPetition[?] Test Cycles
<Repetition>*, *<Stop Cond>*, *<Step Mode>

<Repetition>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 10000 |	Multiple measurement (*counting*, until `Status = STEP | RDY`)	SING	–	V3.40
CONTinuous |	Continuous measurement (until `STOP` or `ABORT`)			
SINGleshot |	Single shot measurement (until `Status = RDY`)			
DEFault,	Sets the value to the default setting			
<Stop Cond>	Description of parameters	Def. value	Def. unit	FW vers.
NONE |	Continue measurement even in case of error	NONE	–	V3.40
SONerror |	Stop measurement in case of error *(stop on error)*			
DEFault,	Sets the value to the default setting			
<Step Mode>	Description of parameters	Def. value	Def. unit	FW vers.
STEP |	Interrupt measurement after each statistics cycle	NONE	–	V3.40
NONE |	Continue measurement according to its rep. Mode			
DEFault	Sets the value to the default setting			

Description of command

This command determines the repetition mode, stop condition, and stepping mode for the measurement.

Note: In the case of READ commands (`READ:...`), the <Repetition> parameter has no effect; the measurement is always stopped after a single shot.

DEFault:SPECtrum:ACP:CONTrol[?] Default Settings

<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON |	The parameters are set to their default values	ON	–	V3.40
OFF	Some or all parameters are not set to default			

Description of command

If used as a setting command with the parameter *ON*, this command sets all parameters of the subsystem `SPECtrum:ACP:CONTrol` to their default values (the setting *OFF* results in an error message).

If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.

CONFigure:SPECtrum:ACP:CONTrol:FOFFset:ACP<nr>[?] <Freq. Offset> ACP Frequency Offset

<Freq. Offset>	Description of parameters	Def. value	Def. unit	FW vers.
	The ACP frequency offset depends on the network standard:		Hz	V3.40
0 to 2 MHz | **OFF |** **ON**	**Band Class 0, US Cellular** Measurement disabled, result INV Enable measurement, last setting re-activated	<nr> = 1: 870.00 kHz <nr> = 2: 885.00 kHz <nr> = 3: 900.00 kHz <nr> = 4: 1980.00 kHz		
0 to 2 MHz | **OFF |** **ON**	**Band Class 0, Korean Cellular** Measurement disabled, result INV Enable measurement, last setting re-activated	<nr> = 1: 870.00 kHz <nr> = 2: 885.00 kHz <nr> = 3: 900.00 kHz <nr> = 4: 1980.00 kHz		
0 to 2 MHz | **OFF |** **ON**	**Band Class 1, North American PCS** Measurement disabled, result INV Enable measurement, last setting re-activated	<nr> = 1: 1150.00 kHz <nr> = 2: 1200.00 kHz <nr> = 3: 1250.00 kHz <nr> = 4: 1980.00 kHz		
0 to 2 MHz | **OFF |** **ON**	**Band Class 2, TACS** Measurement disabled, result INV Enable measurement, last setting re-activated	<nr> = 1: 870.00 kHz <nr> = 2: 885.00 kHz <nr> = 3: 900.00 kHz <nr> = 4: 1980.00 kHz		
0 to 2 MHz | **OFF |** **ON**	**Band Class 3, JTACS** Measurement disabled, result INV Enable measurement, last setting re-activated	<nr> = 1: 870.00 kHz <nr> = 2: 885.00 kHz <nr> = 3: 900.00 kHz <nr> = 4: 1980.00 kHz		
0 to 2 MHz | **OFF |** **ON**	**Band Class 4, Korean PCS** Measurement disabled, result INV Enable measurement, last setting re-activated	<nr> = 1: 1150.00 kHz <nr> = 2: 1200.00 kHz <nr> = 3: 1250.00 kHz <nr> = 4: 1980.00 kHz		
0 to 2 MHz | **OFF |** **ON**	**Band Class 5, NMT 450** Measurement disabled, result INV Enable measurement, last setting re-activated	<nr> = 1: 870.00 kHz <nr> = 2: 885.00 kHz <nr> = 3: 900.00 kHz <nr> = 4: 1980.00 kHz		
0 to 2 MHz | **OFF |** **ON**	**Band Class 6, IMT-2000** Measurement disabled, result INV Enable measurement, last setting re-activated	<nr> = 1: 1150.00 kHz <nr> = 2: 1200.00 kHz <nr> = 3: 1250.00 kHz <nr> = 4: 1980.00 kHz		
0 to 2 MHz | **OFF |** **ON**	**Band Class 7, North American 700 MHz** Measurement disabled, result INV Enable measurement, last setting re-activated	<nr> = 1: 870.00 kHz <nr> = 2: 885.00 kHz <nr> = 3: 900.00 kHz <nr> = 4: 1980.00 kHz		
0 to 2 MHz | **OFF |** **ON**	**Band Class 8, 1800 MHz** Measurement disabled, result INV Enable measurement, last setting re-activated	<nr> = 1: 1150.00 kHz <nr> = 2: 1200.00 kHz <nr> = 3: 1250.00 kHz <nr> = 4: 1980.00 kHz		
0 to 2 MHz | **OFF |** **ON**	**Band Class 9, North American 900 MHz** Measurement disabled, result INV Enable measurement, last setting re-activated	<nr> = 1: 870.00 kHz <nr> = 2: 885.00 kHz <nr> = 3: 900.00 kHz <nr> = 4: 1980.00 kHz		
0 to 2 MHz | **OFF |** **ON**	**Band Class 10, Secondary 800 MHz** Measurement disabled, result INV Enable measurement, last setting re-activated	<nr> = 1: 870.00 kHz <nr> = 2: 885.00 kHz <nr> = 3: 900.00 kHz <nr> = 4: 1980.00 kHz		

Description of command

This command determines four frequency offset values (<nr> = 1 to 4) which define the four adjacent channel pairs. *OFF* will disable the mesurement on the specified frequency pair and *INV* will be returned as result. See also the command `CONFigure:NETWork:STANdard`

Subsystem LIMit

a)SPECtrum:ACP:LIMit

The subsystem *SPECtrum:ACP:LIMit* defines tolerance values for the ACP Spetrum measurement.

CONFigure:SPECtrum:ACP:LIMit:ACP<nr>[?] Limits
<ACP Limit>

<ACP Limit>	Description of parameters	Def. value	Def. unit	FW vers.
–80.0 to +10.0 | **OFF**	Power limit for ACP<nr> Disables the tolerance check for ACP<nr>	<nr> = 1: -43 dB <nr> = 2: -43 dB <nr> = 3: -43 dB <nr> = 4: -54 dB	dB	V3.40

Description of command

This command defines the upper power limits for the adjacent channel pairs <nr> = 1 to 4. These limits apply to any of the statistic evaluation modes (*Current, Average and Maximum*).

DEFault:SPECtrum:ACP:LIMit[?] Default Settings
<Enable>

Enable	Description of parameters	Def. value	Def. unit	FW vers.
ON | **OFF**	The parameters are set to their default values Some or all parameters are not set to default	ON	–	V3.40

Description of command

If used as a setting command with the parameter *ON*, this command sets all parameters of the subsystem `SPECtrum:ACP:LIMit` to their default values (the setting *OFF* results in an error message).

If used as a query, the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.

Measured Values

The subsystem *SPECtrum:ACP* determines and outputs the results of the ACP Spectrum measurement.

READ[:SCALar]:SPECtrum:ACP? FETCh[:SCALar]:SPECtrum:ACP? SAMPle[:SCALar]:SPECtrum:ACP?		Scalar results: Start single shot measurement and return results Read out measurement results (unsynchronized) Read out measurement results (synchronized)			
Returned values		**Value range**	**Def. value**	**Def. unit**	**FW vers.**
Power of adj. Channel –4	**(Current),**	–80.0 dB to 0.0 dB	NAN	dB	V3.40
Power of adj. Channel –3	**(Current),**		NAN		
Power of adj. Channel –2	**(Current),**		NAN		
Power of adj. Channel –1	**(Current),**		NAN		
Power of adj. Channel +1	**(Current),**		NAN		
Power of adj. Channel +2	**(Current),**		NAN		
Power of adj. Channel +3	**(Current),**		NAN		
Power of adj. Channel +4	**(Current),**		NAN		
Power of adj. Channel –4	**(Average),**	–80.0 dB to 0.0 dB	NAN	dB	
Power of adj. Channel –3	**(Average),**		NAN		
Power of adj. Channel –2	**(Average),**		NAN		
Power of adj. Channel –1	**(Average),**		NAN		
Power of adj. Channel +1	**(Average),**		NAN		
Power of adj. Channel +2	**(Average),**		NAN		
Power of adj. Channel +3	**(Average),**		NAN		
Power of adj. Channel +4	**(Average),**		NAN		
Power of adj. Channel –4	**(Maximum),**	–80.0 dB to 0.0 dB	NAN	dB	
Power of adj. Channel –3	**(Maximum),**		NAN		
Power of adj. Channel –2	**(Maximum),**		NAN		
Power of adj. Channel –1	**(Maximum),**		NAN		
Power of adj. Channel +1	**(Maximum),**		NAN		
Power of adj. Channel +2	**(Maximum),**		NAN		
Power of adj. Channel +3	**(Maximum),**		NAN		
Power of adj. Channel +4	**(Maximum),**		NAN		
Channel Power	**(Current),**	–80.0 dBm to 0.0 dBm	NAN	dBm	
Channel Power	**(Average),**		NAN		
Channel Power	**(Maximum),**		NAN		
Out of Tolerance,		0 to 100 %	NAN	–	
Current Statistics		1 to 10000	NAN	–	
Description of command					
These commands are always queries. They start a measurement and output all scalar measurement results.					

CALCulate[:SCALar]:SPECtrum:ACP:MATChing:LIMit? Limit Matching

Returned values	Value range	Def. value	Def. unit	FW vers.
Tolerance Channel –4 (Current), **Tolerance Channel –3 (Current),** **Tolerance Channel –2 (Current),** **Tolerance Channel –1 (Current),** **Tolerance Channel +1 (Current),** **Tolerance Channel +2 (Current),** **Tolerance Channel +3 (Current),** **Tolerance Channel +4 (Current),**	NMAU | NMAL | INV | OK	INV	–	V3.40
Tolerance Channel –4 (Average), **Tolerance Channel –3 (Average),** **Tolerance Channel –2 (Average),** **Tolerance Channel –1 (Average),** **Tolerance Channel +1 (Average),** **Tolerance Channel +2 (Average),** **Tolerance Channel +3 (Average),** **Tolerance Channel +4 (Average),**	NMAU | NMAL | INV | OK	INV	–	
Tolerance Channel –4 (Maximum), **Tolerance Channel –3 (Maximum),** **Tolerance Channel –2 (Maximum),** **Tolerance Channel –1 (Maximum),** **Tolerance Channel +1 (Maximum),** **Tolerance Channel +2 (Maximum),** **Tolerance Channel +3 (Maximum),** **Tolerance Channel +4 (Maximum),**	NMAU | NMAL | INV | OK	INV	–	

Description of command

This command is always a query. It indicates whether and in which way the (fixed) limit have been exceeded. The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average*, and the *Maximum* value. The following messages may be generated:

NMAU	Tolerance value underflow	*not matching, underflow*
NMAL	Tolerance value exceeded	*not matching, overflow*
INV	Measurement invalid	*invalid*
OK	Tolerance value matched	

CDPower Measurements

The subsystem *CDPower* measures the Code Domain Power. The subsystem corresponds to the measurement menu *CDPower* and the sections related to this application in the associated popup menu *Code Domain Power Configuration.*

Common Settings – Subsystem CDPower:CPCCommon (O-QPSK and H-PSK)

The subsystem *CDPower:CPCCommon …* configures the generated RF signal and defines the tolerance values. The settings are valid for all *Code Dom. Power* measurement applications.

Measurement Environment – Subsystem CDPower:CPCCommon...:ENVironment

The subsystem *CDPower:CPCCommon:ENVironment…* configures the generated RF signal. It corresponds to the *Measurement Environment* section in the *Control* tab of the *Code Dom. Power Configuration* menu. The settings are used only if the environment is enabled; see `CONFigure:CDPower:CPCCommon:ENVironment:ENABle`.

CONFigure:CDPower:CPCCommon:ENVironment:ENABle[?] ***<Enable>***				Environment Enable
<Enable>	Description of parameters	Def. Value	Def. Unit	FW vers.
ON | OFF	Enable or disable environment	ON	–	V3.20
Description of command				Sig. State
This command enables or disables the environment for all *Code Domain Power* measurement applications.				All

CONFigure:CDPower:CPCCommon:ENVironment:POWer:CDMA[?] **<CDMA Power>**				CDMA Power
<CDMA Power>	Description of parameters	Def. value	Def. unit	FW vers.
–120.0 dBm to –33.0 dBm | –120.0 dBm to –16.0 dBm | –100.0 dBm to +7.0 dBm | DEFault | MINimum | MAXimum	RF1 OUT, 0 dB ext. atten RF2 OUT, 0 dB ext. atten RF3 OUT, 0 dB ext. atten Sets the value to the default setting Sets the value to the range minimum Sets the value to the range maximum	–50.0	dBm	V3.20
Description of command				Sig. State
This command determines the total CDMA output power (absolute value, in dBm) of the CMU. The CDMA Power value range depends on the RF input used and the external attenuation set.				All

CONFigure:CDPower:CPCCommon:ENVironment:LEVel:FPICh[?] F-PICH Level
<Pilot Level>

<Pilot Level>	Description of parameters	Def. value	Def. unit	FW vers.
–20.0 dB to –7.0 dB |	Pilot Level	–7.0	dB	V3.20
OFF	F-PICH switched off			

Description of command	Sig. State
This command determines the level in the forward pilot channel of the CMU. The channel power is in units relative to the total CDMA power.	All

CONFigure:CDPower:CPCCommon:ENVironment:LEVel:FFCH[?] F-FCH Level
<FCH Level>

<FCH Level>	Description of parameters	Def. value	Def. unit	FW vers.
–20.0 dB to –7.0 dB |	FCH Level	–7.4	dB	V3.20
OFF	F-FCH switched off			

Description of command	Sig. State
This command determines the level in the forward fundamental channel of the CMU. The channel power is in units relative to the total CDMA power.	All

CONFigure:CDPower:CPCCommon:ENVironment:LEVel:FSCH:ZERO[?] F-SCH0 Level
<SCH0 Level>

<SCH0 Level>	Description of parameters	Def. value	Def. unit	FW vers.
–20.0 dB to –7.0 dB |	F-SCH0 Level	OFF	dB	V3.20
OFF	F-SCH0 switched off			

Description of command	Sig. State
This command determines the level in the forward SCH0 channel of the CMU. The channel power is in units relative to the total CDMA power.	All

CONFigure:CDPower:CPCCommon:ENVironment:LEVel:FSCH:ONE[?] F-SCH1 Level
<SCH1 Level>

<SCH1 Level>	Description of parameters	Def. value	Def. unit	FW vers.
–20.0 dB to –7.0 dB |	F-SCH1 Level	OFF	dB	V3.20
OFF	F-SCH1 switched off			

Description of command	Sig. State
This command determines the level in the forward SCH1 channel of the CMU. The channel power is in units relative to the total CDMA power.	All

CONFigure:CDPower:CPCCommon:ENVironment:EBNT:FFCH? F-FCH Eb/Nt
<Eb/Nt>

<Eb/Nt>	Description of parameters	Def. value	Def. unit	FW vers.
–30.969 dB to 18.072 dB	Calculated F-FCH Eb/Nt	–	dB	V3.20

Description of command	Sig. State
This command is always a query. It returns the calculated signal to noise ratio for the forward FCH. This quantity is undefined unless the AWGN generator is turned on (`CONFigure:CDPower:CPCCommon:ENVironment:IMPairments:LEVel:AWGN`). The quoted range of values is valid for data rates between 9.6 kbps and 153.6 kbps; see *Eb/Nt Calculation* in Chapter 4.	All

CONFigure:CDPower:CPCCommon:ENVironment:EBNT:FSCH:ZERO? ***<Eb/Nt>***				F-SCH0 Eb/Nt
<Eb/Nt>	Description of parameters	Def. value	Def. unit	FW vers.
–30.969 dB to 18.072 dB	Calculated F-SCH0 Eb/Nt	–	dB	V3.20
Description of command				Sig. State
This command is always a query. It returns the calculated signal to noise ratio for the forward SCH0. This quantity is undefined unless the AWGN generator is turned on (`CONFigure:CDPower:CPCCommon:ENVironment:IMPairments:LEVel:AWGN`). The quoted range of values is valid for data rates between 9.6 kbps and 153.6 kbps; see *Eb/Nt Calculation* in Chapter 4.				All

CONFigure:CDPower:CPCCommon:ENVironment:EBNT:FSCH:ONE? ***<Eb/Nt>***				F-SCH1 Eb/Nt
<Eb/Nt>	Description of parameters	Def. value	Def. unit	FW vers.
–30.969 dB to 18.072 dB	Calculated F-SCH1 Eb/Nt	–	dB	V3.20
Description of command				Sig. State
This command is always a query. It returns the calculated signal to noise ratio for the forward SCH1. This quantity is undefined unless the AWGN generator is turned on (`CONFigure:CDPower:CPCCommon:ENVironment:IMPairments:LEVel:AWGN`). The quoted range of values is valid for data rates between 9.6 kbps and 153.6 kbps; see *Eb/Nt Calculation* in Chapter 4.				All

CONFigure:CDPower:CPCCommon:ENVironment:FRATe:FFCH[?] ***<Frame Rate>***				Frame Rate
<Frame Rate>	Description of parameters	Def. value	Def. unit	FW vers.
EIGHth |	Frames at 1/8 of the rate set	FULL	–	V3.20
QUARter |	Frames at 1/4 of the rate set			
HALF |	Frames at 1/2 of the rate set			
FULL |	Frames at the full rate set			
DEFault				
Description of command				Sig. State
This command sets the frame rate for the variable rate traffic channel.				All

CONFigure:CDPower:CPCCommon:ENVironment:IMPairments:AWGN[?] ***<AWGN Level>***				AWGN Level
<AWGN Level>	Description of parameters	Def. value	Def. unit	FW vers.
–20.0 dB to +4.0 dB |	AWGN level	OFF	dB	V3.20
DEFault |	Sets the value to the default setting			
MINimum |	Sets the value to the range minimum			
MAXimum |	Sets the value to the range maximum			
OFF,				
Description of command				Sig. State
This command determines an Additional White Gaussian Noise level to impair the CMU output signal.				All

CONFigure:CDPower:CPCCommon:ENVironment:IMPairments:FOFFset[?] BS Frequency Offset
<BS Freq Offset>

<BS Freq Offset>	Description of parameters	Def. value	Def. unit	FW vers.
–50.0 kHz to +50.0 kHz |	BS frequency offset	OFF	Hz	V3.20
DEFault |	Sets the value to the default setting			
MINimum |	Sets the value to the range minimum			
MAXimum |	Sets the value to the range maximum			
OFF				

Description of command	Sig. State
This command determines a frequency offset to impair the CMU output signal.	All

CONFigure:CDPower:CPCCommon:ENVironment:IMPairments:ITFer[?] Injected Tx FER
<FER>

<FER>	Description of parameters	Def. value	Def. unit	FW vers.
0% to 50% |	Injected Tx FER	OFF	–	V3.20
OFF |	Switch FER injection off (equiv. to 0%)			
ON	Re-activate FER injection, using the previously defined value			

Description of command	Sig. State
This command defines a percentage of faulty (i.e. erasure) frames that the CMU injects into all traffic channels of its BS Signal.	All

CONFigure:CDPower:CPCCommon:ENVironment:PCBits[?] Power Control Bits
<Power Control Bits>

<Power Control Bits>	Description of parameters	Def. value	Def. unit	FW vers.
OFF |	Disable power control bits	AUT	–	V3.20
AUTomatic |	Auto mode, closed-loop operation			
HOLD |	Alternating up/down control bits			
ADOW |	All power control bits down			
AUP |	All power control bits up			
RTES |	Range test mode			
PATTern	Pattern defined by means of the `CONF:BSS:PCB:PATTern...` commands			

Description of command	Sig. State
This command selects the power control bit sequence that the CMU sends to the mobile station to control its output power.	All

Tolerance values – Subsystem CDPower:CPCCommon:LIMit

The subsystem *CDPower:CPCCommon:LIMit* defines tolerance values for the CDP measurement in all four applications. The subsystem corresponds to the *Limits* tab in the popup menu *Code Dom. Power Configuration.*

CONFigure:CDPower:CPCCommon:LIMit:IQLCheck[?]
<Enable>

IQ Leakage Check

Enable	Description of parameters	Def. value	Def. unit	FW vers.
ON | OFF	Enable or disable IQ Leakage Check	ON	–	V3.20

Description of command	Sig. State
This command enables or disables the I/Q Leakage Check. In the *OFF* setting, the limit check of each code channel is restricted to the active branch.	All

CONFigure:CDPower:CPCCommon:CMAX:LIMit:ASYMmetric[:COMBined][?]
<Carrier Feedthrough Limit>, <Freq Error Limit>, <Rho Limit>

Limits

<Carrier Feedthrough Limit>	Description of parameters	Def. value	Def. unit	
–120.0 to –20.0 | DEFault | MINimum | MAXimum | OFF,	Carrier feedthrough limit Sets the value to the default setting Sets the value to the range minimum Sets the value to the range maximum	–40.0	dB	
<Freq Error Limit>	**Description of parameters**	**Def. value**	**Def. unit**	
0 to 1000.0 Hz | DEFault | MINimum | MAXimum | OFF,	Carrier frequency error limit Sets the value to the default setting Sets the value to the range minimum Sets the value to the range maximum	300.0	Hz	
<Rho Limit>	**Description of parameters**	**Def. value**	**Def. unit**	**FW vers.**
0.0 to 1.0 | DEFault | MINimum | MAXimum | OFF	Correlated power to the total power ratio limit Sets the value to the default setting Sets the value to the range minimum Sets the value to the range maximum	0.944	–	V3.05

Description of command	Sig. State
This command defines upper limits for the different traces and for the scalar modulation parameters derived from them. The keywords `CMAX` and `AVERage` refer to the *Current* and *Max.* display and for the *Average* display, respectively.	All

CONFigure:CDPower:CPCCommon:AVERage:LIMit:ASYMmetric[:COMBined][?] Limits
<Carrier Feedthrough Limit Average>, <Freq Error Limit Average>, <Rho Limit Average>

<Carrier Feedthrough Limit>	Description of parameters	Def. value	Def. unit	
–120.0 to –20.0 | DEFault | MINimum | MAXimum | OFF,	Carrier feedthrough limit Sets the value to the default setting Sets the value to the range minimum Sets the value to the range maximum	–40.0	dB	
<Freq Error Limit>	Description of parameters	Def. value	Def. unit	
0 to 1000.0 Hz | DEFault | MINimum | MAXimum | OFF,	Carrier frequency error limit Sets the value to the default setting Sets the value to the range minimum Sets the value to the range maximum	300.0	Hz	
<Rho Limit>	Description of parameters	Def. value	Def. unit	FW vers.
0.0 to 1.0 | DEFault | MINimum | MAXimum | OFF	Correlated power to the total power ratio limit Sets the value to the default setting Sets the value to the range minimum Sets the value to the range maximum	0.944	–	V3.05
Description of command				Sig. State
This command defines upper limits for the different traces and for the scalar modulation parameters derived from them. The keywords `CMAX` and `AVERage` refer to the *Current* and *Max.* display and for the *Average* display, respectively.				All

DEFault:CDPower:CPCCommon:LIMit[?] Default Settings
<Enable>

Enable	Description of parameters	Def. value	Def. unit	FW vers.
ON | OFF	The parameters are set to their default values Some or all parameters are not set to default	ON	–	V3.05
Description of command				Sig. State
If used as a setting command with the parameter *ON,* this command sets all parameters of the subsystem CDPower:CPCCommon:LIMit to their default values (the setting OFF results in an error message). If used as a query, the command returns whether all parameters are set to their default values *(ON)* or not *(OFF).*				All

CDPower:CDPW

The subsystem *CDPower:CDPW* measures the MS Code Domain Power output. The subsystem corresponds to the measurement menu *Code Domain Power*, application *CDP*, and the sections related to this application in the associated popup menu *Code Domain Power Configuration.*

INITiate:CDPower:CDPW **ABORt:CDPower:CDPW** **STOP:CDPower:CDPW** **CONTinue:CDPower:CDPW**	Start new measurement Abort running measurement and switch off Stop measurement after current stat. cycle Next measurement step (*stepping mode*)	⇒ *RUN* ⇒ *OFF* ⇒ *STOP* ⇒ *RUN*
Description of command	Sig. State	FW vers.
These commands have no query form. They start and stop the code domain power measurement, setting it to the status indicated in the top right column.	All	V3.05

CONFigure:CDPower:CDPW:EREPorting[?] ***<Report Mode>***				Event Reporting
<Report Mode>	Description of parameters	Def. value	Def. unit	FW vers.
SRQ | SOPC | SRSQ | DEFault | OFF	Service request Single operation complete SRQ and SOPC Sets the value to the default setting No reporting	OFF	–	V3.05
Description of command				Sig. State
This command defines the events generated when the measurement is terminated or stopped (see *Event Reporting* in Chapter 5 of the CMU manual).				All

CONFigure:CDPower:CDPW:CMAX:LIMit:ASYMmetric[:COMBined][?] **<CDP Limit Y>**				Limits
<CDP Limit Y>	Description of parameters	Def. value	Def. unit	FW vers.
–60.0 to 0 | MINimum | MAXimum | DEFault | OFF	Peak code domain power Y limit Sets the value to the range minimum Sets the value to the range maximum Sets the value to the default setting	–23.0	dB	V3.05
Description of command				Sig. State
This command defines the upper limit for the code domain power. The keywords `CMAX` and `AVERage` refer to the *Current* and *Max.* display and for the *Average* display, respectively.				All

CONFigure:CDPower:CDPW:AVERage:LIMit:ASYMmetric[:COMBined][?] **<CDP Limit Y Average>**				Limits
<CDP Limit Y>	Description of parameters	Def. value	Def. unit	FW vers.
–60.0 to 0 | MINimum | MAXimum | DEFault | OFF	Peak code domain power Y limit Sets the value to the range minimum Sets the value to the range maximum Sets the value to the default setting	–23.0	dB	V3.05
Description of command				Sig. State
This command defines the upper limit for the code domain power. The keywords `CMAX` and `AVERage` refer to the *Current* and *Max.* display and for the *Average* display, respectively.				All

DEFault:CDPower:CDPW:LIMit[?] *<Enable>*				Default Settings
Enable	Description of parameters	Def. value	Def. unit	FW vers.
ON | OFF	The parameters are set to their default values Some or all parameters are not set to default	ON	–	V3.05
Description of command				Sig. State
If used as a setting command with the parameter *ON*, this command sets all parameters of the subsystem CDPower:CDPW:LIMit to their default values (the setting OFF results in an error message). If used as a query, the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.				All

FETCh[:SCALar]:CDPower:CDPW:STATus?				Measurement Status
Return	Description of parameters	Def. value	Def. unit	FW vers.
OFF | RUN | STOP | ERR | STEP | RDY	Measurement in the OFF state (*RST or ABORt) Running (after INITiate, CONTinue or READ) Stopped (STOP) OFF (could not be started) Stepping mode (<stepmode>=STEP) Stopped according to repetition mode and stop condition	OFF	–	V3.05
1 to 10000 | NONE	Counter for current statistics cycle No counting mode set	NONE	–	
1 to 1000 NONE	Counter for current evaluation period within a cycle Statistic count set to off	NONE	–	
Description of command				Sig. State
This command is always a query. It returns the status of the measurement (see Chapters 3 and 5).				All

Subsystem CDPower:CDPW:CONTrol

The subsystem *CDPower:CDPW:CONTrol* defines the resultmode, repetition mode, statistic count, and stop condition of the measurement. These settings are provided in the *Control* tab in the popup menu *Code Domain Power Configuration.*

CONFigure:CDPower:CDPW:CONTrol[?] Scope of Measurement
<Result Mode>*, *<Current Statistics>*, *<Repetition>*, *<Stop Cond>*, *<Step Mode>

<Result Mode>	Description of parameters	Def. value	Def. unit	
SCALar | ARRay,	Scalar values only (incl. ramp matching) Scalar measured values and arrays	ARR	–	
<Current Statistics>	Description of parameters	Def. value	Def. unit	
1 to 1000,	Number of bursts per statistics cycle	100	–	
<Repetition>	Description of parameters	Def. value	Def. unit	
1 to 10000 | CONTinuous | SINGleshot | DEFault,	Multiple measurement (*counting*, until `Status = STEP | RDY)` Continuous measurement (until `STOP` or `ABORT)` Single shot measurement (until `Status = RDY`) Sets the value to the default setting	SING	–	
<Stop Cond>	Description of parameters	Def. value	Def. unit	
NONE | SONerror | DEFault,	Continue measurement even in case of error Stop measurement in case of error *(stop on error)* Sets the value to the default setting	NONE	–	
<Step Mode>	Description of parameters	Def. value	Def. unit	FW vers.
STEP | NONE | DEFault	Interrupt measurement after each statistics cycle Continue measurement according to its rep. Mode Sets the value to the default setting	NONE	–	V3.05
Description of command				Sig. State
This command combines the `...CONTrol:RMODe`, `...CONTrol:STATistics` and the `...CONTrol:REPetition` commands, see below.				All

CONFigure:CDPower:CDPW:CONTrol:SFACtor[?] Spreading Factor
<Spreading_Factor>

<Result Mode>	Description of parameters	Def. value	Def. unit	FW vers.
16 | 32	Spreading factor	32	–	V3.20
Description of command				Sig. State
This command defines the code class in which the uplink CDMA signal is evaluated.				All

CONFigure:CDPower:CDPW:CONTrol:RMODe[?] Result mode
<Result Mode>

<Result Mode>	Description of parameters	Def. value	Def. unit	FW vers.
SCALar | ARRay	Scalar values only (incl. ramp matching) Scalar measured values and arrays	ARR	–	V3.05
Description of command				Sig. State
This command specifies the type of measured values.				All

CONFigure:CDPower:CDPW:CONTrol:STATistics[?] Statistic Count
<Current Statistics >

<Current Statistics>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 1000	Number of bursts per statistics cycle	100	–	V3.05

Description of command	Sig. State
This command defines the number of bursts forming a statistics cycle.	All

CONFigure:CDPower:CDPW:CONTrol:REPetition[?] Test Cycles
<Repetition>, <Stop Cond>, <Step Mode>

<Repetition>	Description of parameters	Def. value	Def. unit	
1 to 10000 |	Multiple measurement (*counting*, until `Status = STEP | RDY`)	SING	–	
CONTinuous |	Continuous measurement (until `STOP` or `ABORT`)			
SINGleshot |	Single shot measurement (until `Status = RDY`)			
DEFault,	Sets the value to the default setting			
<Stop Cond>	**Description of parameters**	**Def. value**	**Def. unit**	
NONE |	Continue measurement even in case of error	NONE	–	
SONerror |	Stop measurement in case of error *(stop on error)*			
DEFault,	Sets the value to the default setting			
<Step Mode>	**Description of parameters**	**Def. value**	**Def. unit**	**FW vers.**
STEP |	Interrupt measurement after each statistics cycle	NONE	–	V3.05
NONE |	Continue measurement according to its rep. Mode			
DEFault	Sets the value to the default setting			

Description of command	Sig. State
This command determines the repetition mode, stop condition, and stepping mode for the measurement. ***Note:*** *In the case of READ commands (`READ:...`), the <Repetition> parameter has no effect; the measurement is always stopped after a single shot.*	All

CONFigure:CDPower:CDPW:CONTrol:RORDer[?] Result Order
<Result Order>

<Result Order>	Description of parameters	Def. value	Def. unit	FW vers.
HADamard |	Walsh code channels returned using Hadamard matrix	HAD	–	V3.05
BITReverse	Walsh code channels returned at MSB to LSB			

Description of command	Sig. State
This command defines the method used to display the code channels. HADamard displays the code channels in order determined by the Hadamard matrix. BITReverse displays the code channels so that the related code channels are adjacent to each other. This setting is only available for Code Domain and Peak Code Domain Error measurement applications.	All

Measured Values – Subsystem CDPower:CDPW

The subsystem *CDPower:CDPW* determines and outputs the results of the Code Domain Power measurements.

I Signal Measurement

READ:ARRay:CDPower:CDPW:ISIGnal[:VALue]:CURRent?	Start single shot meas. and return results
FETCh:ARRay:CDPower:CDPW:ISIGnal[:VALue]:CURRent?	Read meas. results (unsynchronized)
SAMPle:ARRay:CDPower:CDPW:ISIGnal[:VALue]:CURRent?	Read results (synchronized)

Returned values	Value range	Def. value	Def. unit	FW vers.
Walsh code	W_0^{32} to W_{31}^{32} for spreading factor 32 W_0^{16} to W_{31}^{16} for spreading factor 16	NAN		V3.05 V3.20

Description of command	Sig. State
These commands are always queries. They start a measurement and output the levels of the Walsh Code of the in phase signal path (I-signal). The number of values depends on the spreading factor set via `CONFigure:CDPower:CDPW:CONTrol:SFACtor`.	All

I Signal Measurement

READ:ARRay:CDPower:CDPW:ISIGnal[:VALue]:AVERage?	Start single shot meas. and return results
FETCh:ARRay:CDPower:CDPW:ISIGnal[:VALue]:AVERage?	Read meas. results (unsynchronized)
SAMPle:ARRay:CDPower:CDPW:ISIGnal[:VALue]:AVERage?	Read results (synchronized)

Returned values	Value range	Def. value	Def. unit	FW vers.
Walsh code	W_0^{32} to W_{31}^{32} for spreading factor 32 W_0^{16} to W_{31}^{16} for spreading factor 16	NAN		V3.05 V3.20

Description of command	Sig. State
These commands are always queries. They start a measurement and output the levels of the Walsh Code of the in phase signal path (I-signal). The number of values depends on the spreading factor set via `CONFigure:CDPower:CDPW:CONTrol:SFACtor`.	All

I Signal Measurement

READ:ARRay:CDPower:CDPW:ISIGnal[:VALue]:MAXimum?	Start single shot meas. and return results
FETCh:ARRay:CDPower:CDPW:ISIGnal[:VALue]:MAXimum?	Read meas. results (unsynchronized)
SAMPle:ARRay:CDPower:CDPW:ISIGnal[:VALue]:MAXimum?	Read results (synchronized)

Returned values	Value range	Def. value	Def. unit	FW vers.
Walsh code	W_0^{32} to W_{31}^{32} for spreading factor 32 W_0^{16} to W_{31}^{16} for spreading factor 16	NAN		V3.05 V3.20

Description of command	Sig. State
These commands are always queries. They start a measurement and output the levels of the Walsh Code of the in phase signal path (I-signal). The number of values depends on the spreading factor set via `CONFigure:CDPower:CDPW:CONTrol:SFACtor`.	All

	Q signal Measurement
READ:ARRay:CDPower:CDPW:QSIGnal[:VALue]:CURRent?	Start single shot meas. and return results
FETCh:ARRay:CDPower:CDPW:QSIGnal[:VALue]:CURRent?	Read meas. results (unsynchronized)
SAMPle:ARRay:CDPower:CDPW:QSIGnal[:VALue]:CURRent?	Read results (synchronized)

Returned values	Value range	Def. value	Def. unit	FW vers.
Walsh code	W_0^{32} to W_{31}^{32} for spreading factor 32 W_0^{16} to W_{31}^{16} for spreading factor 16	NAN		V3.05 V3.20

Description of command	Sig. State
These commands are always queries. They start a measurement and output the levels of the Walsh Code of the quadrature signal path (Q-signal). The number of values depends on the spreading factor set via `CONFigure:CDPower:CDPW:CONTrol:SFACtor`.	All

	Q Signal Measurement
READ:ARRay:CDPower:CDPW:QSIGnal[:VALue]:AVERage?	Start single shot meas. and return results
FETCh:ARRay:CDPower:CDPW:QSIGnal[:VALue]:AVERage?	Read meas. results (unsynchronized)
SAMPle:ARRay:CDPower:CDPW:QSIGnal[:VALue]:AVERage?	Read results (synchronized)

Returned values	Value range	Def. value	Def. unit	FW vers.
Walsh code	W_0^{32} to W_{31}^{32} for spreading factor 32 W_0^{16} to W_{31}^{16} for spreading factor 16	NAN		V3.05 V3.20

Description of command	Sig. State
These commands are always queries. They start a measurement and output the levels of the Walsh Code of the quadrature signal path (Q-signal). The number of values depends on the spreading factor set via `CONFigure:CDPower:CDPW:CONTrol:SFACtor`.	All

	Q Signal Measurement
READ:ARRay:CDPower:CDPW:QSIGnal[:VALue]:MAXimum?	Start single shot meas. and return results
FETCh:ARRay:CDPower:CDPW:QSIGnal[:VALue]:MAXimum?	Read meas. results (unsynchronized)
SAMPle:ARRay:CDPower:CDPW:QSIGnal[:VALue]:MAXimum?	Read results (synchronized)

Returned values	Value range	Def. value	Def. unit	FW vers.
Walsh code	W_0^{32} to W_{31}^{32} for spreading factor 32 W_0^{16} to W_{31}^{16} for spreading factor 16	NAN		V3.05 V3.20

Description of command	Sig. State
These commands are always queries. They start a measurement and output the levels of the Walsh Code of the quadrature signal path (Q-signal). The number of values depends on the spreading factor set via `CONFigure:CDPower:CDPW:CONTrol:SFACtor`.	All

	Scalar results:
READ[:SCALar]:CDPower:CDPW?	Start single shot measurement and return results
FETCh[:SCALar]:CDPower:CDPW?	Read out measurement results (unsynchronized)
SAMPle[:SCALar]:CDPower:CDPW?	Read out measurement results (synchronized)

Returned values	Value range	Def. value	Def. unit	FW vers.
MS Power (x3),	–100.0 dBm to –50.0 dBm	NAN	dBm	V3.05
Carrier Feedthrough (x3),	–120.0 dB to –20.0 dB	NAN	dB	
Frequency Error (x3),	0 to 1000.0 Hz	NAN	Hz	
Rho (x3),	0.0 to 1.0	NAN	–	
Out of Tolerance,	0.0% to 100.0%	NAN	–	
Current Statistics	1 to 10000	NAN	–	

Description of command	Sig. State
These commands are always queries. They start a measurement and output all scalar measurement results. The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average,* and the *MMax* value.	All

CALCulate[:SCALar]:CDPower:CDPW:MATChing:LIMit?	Limit Matching

Returned values	Value range	Def. value	Def. unit	FW vers.
CDP Carrier Feedthrough (x3),	For all values	INV	–	V3.05
CDP Frequency Error (x3),		INV	–	
CDP Rho (x3)	NMAU | NMAL | INV | OK	INV	–	

Description of command	Sig. State
This command is always a query. It indicates whether and in which way the (fixed) limit have been exceeded. The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average,* and the *MMax* value. The following messages may be generated*:*	All

NMAU	Tolerance value underflow	*not matching, underflow*
NMAL	Tolerance value exceeded	*not matching, overflow*
INV	Measurement invalid	*invalid*
OK	Tolerance value matched	

CALCulate:ARRay:CDPower:CDPW:ISIGnal:CURRent[:RESult]:MATChing:LIMit?	I Signal Tolerance

Returned value	Description	Def. value	Def. unit	FW vers.
32 bit value	Indicator for limit matching in code channel 0 (least significant bit) to 31	NAN	–	V3.05

Description of command	Sig. State
This command is always a query. If a bit is set in the returned value the I signal limit in the corresponding code channel is exceeded.	All

CALCulate:ARRay:CDPower:CDPW:ISIGnal:AVERage[:RESult]:MATChing:LIMit?	I Signal Tolerance

Returned value	Description	Def. value	Def. unit	FW vers.
32 bit value	Indicator for limit matching in code channel 0 (least significant bit) to 31	NAN	–	V3.05

Description of command	Sig. State
This command is always a query. If a bit is set in the returned value the I signal limit in the corresponding code channel is exceeded.	All

CALCulate:ARRay:CDPower:CDPW:ISIGnal:MAXimum[:RESult]:MATChing:LIMit?				I Signal Tolerance
Returned value	Description	Def. value	Def. unit	FW vers.
32 bit value	Indicator for limit matching in code channel 0 (least significant bit) to 31	NAN	–	V3.05
Description of command				Sig. State
This command is always a query. If a bit is set in the returned value the I signal limit in the corresponding code channel is exceeded.				All

CALCulate:ARRay:CDPower:CDPW:QSIGnal:CURRent[:RESult]:MATChing:LIMit?				Q Signal Tolerance
Returned value	Description	Def. value	Def. unit	FW vers.
32 bit value	Indicator for limit matching in code channel 0 (least significant bit) to 31	NAN	–	V3.05
Description of command				Sig. State
This command is always a query. If a bit is set in the returned value the Q signal limit in the corresponding code channel is exceeded.				All

CALCulate:ARRay:CDPower:CDPW:QSIGnal:AVERage[:RESult]:MATChing:LIMit?				Q Signal Tolerance
Returned value	Description	Def. value	Def. unit	FW vers.
32 bit value	Indicator for limit matching in code channel 0 (least significant bit) to 31	NAN	–	V3.05
Description of command				Sig. State
This command is always a query. If a bit is set in the returned value the Q signal limit in the corresponding code channel is exceeded.				All

CALCulate:ARRay:CDPower:CDPW:QSIGnal:MAXimum[:RESult]:MATChing:LIMit?				Q Signal Tolerance
Returned value	Description	Def. value	Def. unit	FW vers.
32 bit value	Indicator for limit matching in code channel 0 (least significant bit) to 31	NAN	–	V3.05
Description of command				Sig. State
This command is always a query. If a bit is set in the returned value the Q signal limit in the corresponding code channel is exceeded.				All

CDPower:PCDep

The subsystem *CDPower:PCDep* measures the MS Peak Code Domain Error Power output. The subsystem corresponds to the measurement menu *Code Domain Power,* application *PCDep,* and the sections related to this application in the associated popup menu *Code Domain Power Configuration.*

Control of measurement – Subsystem CDPower:PCDep

The subsystem *CDPower:PCDep* controls the code domain error power measurement.

INITiate:CDPower:PCDep	Start new measurement	⇒ *RUN*
ABORt:CDPower:PCDep	Abort running measurement and switch off	⇒ *OFF*
STOP:CDPower:PCDep	Stop measurement after current stat. cycle	⇒ *STOP*
CONTinue:CDPower:PCDep	Next measurement step (*stepping mode*)	⇒ *RUN*

Description of command	Sig. State	FW vers.
These commands have no query form. They start and stop the code domain error power measurement, setting it to the status indicated in the top right column.	All	V3.05

CONFigure:CDPower:PCDep:EREPorting[?] Event Reporting
<Report Mode>

<Report Mode>	Description of parameters	Def. value	Def. unit	FW vers.
SRQ |	Service request	OFF	–	V3.05
SOPC |	Single operation complete			
SRSQ |	SRQ and SOPC			
OFF	No reporting			

Description of command	Sig. State
This command defines the events generated when the measurement is terminated or stopped (see *Event Reporting* in Chapter 5 of the CMU manual).	All

CONFigure:CDPower:PCDep:CMAX:LIMit:ASYMmetric[:COMBined][?] Limits
<CDP Limit Y>

<PCDep Limit Y>	Description of parameters	Def. value	Def. unit	FW vers.
–60.0 to 0 |	Peak code domain error power limit	–23.0	dB	V3.05
DEFault |	Sets the value to the default setting			
MINimum |	Sets the value to the range minimum			
MAXimum |	Sets the value to the range maximum			
OFF				

Description of command	Sig. State
This command defines the upper limit for the peak code domain error power. The keywords `CMAX` and `AVERage` refer to the *Current* and *Max.* display and for the *Average* display, respectively.	All

CONFigure:CDPower:PCDep:AVERage:LIMit:ASYMmetric[:COMBined][?] Limits
<PCD Limit Y Average>

<PCDep Limit Y>	Description of parameters	Def. value	Def. unit	FW vers.
–60.0 to 0 | DEFault | MINimum | MAXimum | OFF	Peak code domain error power limit Sets the value to the default setting Sets the value to the range minimum Sets the value to the range maximum	–23.0	dB	V3.05

Description of command	Sig. State
This command defines the upper limit for the peak code domain error power. The keywords `CMAX` and `AVERage` refer to the *Current* and *Max.* display and for the *Average* display, respectively.	All

DEFault:CDPower:PCDep:LIMit[?] Default Settings
<Enable>

Enable	Description of parameters	Def. value	Def. unit	FW vers.
ON | OFF	The parameters are set to their default values Some or all parameters are not set to default	ON	–	V3.05

Description of command	Sig. State
If used as a setting command with the parameter *ON,* this command sets all parameters of the subsystem DEFault:CDPower:PCDep:LIMit to their default values (the setting OFF results in an error message). If used as a query, the command returns whether all parameters are set to their default values *(ON)* or not *(OFF).*	All

FETCh[:SCALar]:CDPower:PCDep:STATus? Measurement Status

Return	Description of parameters	Def. value	Def. unit	FW vers.
OFF | RUN | STOP | ERR | STEP | RDY	Measurement in the OFF state (*RST or ABORt) Running (after INITiate, CONTinue or READ) Stopped (STOP) OFF (could not be started) Stepping mode (<stepmode>=STEP) Stopped according to repetition mode and stop condition	OFF	–	V3.05
1 to 10000 | NONE	Counter for current statistics cycle No counting mode set	NONE	–	
1 to 1000 NONE	Counter for current evaluation period within a cycle Statistic count set to off	NONE	–	

Description of command	Sig. State
This command is always a query. It returns the status of the measurement (see Chapters 3 and 5).	All

Subsystem CDPower:PCDep:CONTrol

The subsystem *CDPower:PCDep:CONTrol* defines the result mode, repetition mode, statistic count, and stop condition of the measurement. These settings are provided in the *Control* tab in the popup menu *Code Domain Power Configuration.*

CONFigure:CDPower:PCDep:CONTrol[?] Scope of Measurement
<Result Mode>*, *<Current Statistics>*, *<Repetition>*, *<Stop Cond>*, *<Step Mode>

<Result Mode>	Description of parameters	Def. value	Def. unit	
SCALar | ARRay,	Scalar values only (incl. ramp matching) Scalar measured values and arrays	ARR	–	
<Current Statistics>	Description of parameters	Def. value	Def. unit	
1 to 1000,	Number of bursts per statistics cycle	100	–	
<Repetition>	Description of parameters	Def. value	Def. unit	
1 to 10000 |	Multiple measurement (counting, until Status = STEP | RDY)	SING	–	
CONTinuous |	Continuous measurement (until STOP or ABORT)			
SINGleshot |	Single shot measurement (until Status = RDY)			
DEFault,	Sets the value to the default setting			
<Stop Cond>	Description of parameters	Def. value	Def. unit	
NONE | SONerror | DEFault,	Continue measurement even in case of error Stop measurement in case of error *(stop on error)* Sets the value to the default setting	NONE	–	
<Step Mode>	Description of parameters	Def. value	Def. unit	FW-Vers.
STEP | NONE | DEFault	Interrupt measurement after each statistics cycle Continue measurement according to its rep. Mode Sets the value to the default setting	NONE	–	V3.05
Description of command				Sig. State
This command combines the `...CONTrol:RMODe`, `...CONTrol:STATistics` and the `...CONTrol:REPetition` commands, see below.				All

CONFigure:CDPower:PCDep:CONTrol:RMODe[?] Result Mode
***<Result Mode>* mode**

<Result Mode>	Description of parameters	Def. value	Def. unit	FW-Vers.
SCALar | ARRay	Scalar values only (incl. ramp matching) Scalar measured values and arrays	ARR	–	V3.05
Description of command				Sig. State
This command specifies the type of measured values.				All

CONFigure:CDPower:PCDep:CONTrol:SFACtor[?] Spreading Factor
<Spreading_Factor>

<Result Mode>	Description of parameters	Def. value	Def. unit	FW vers.
16 | 32	Spreading factor	32	–	V3.20
Description of command				Sig. State
This command defines the code class in which the uplink CDMA signal is evaluated.				All

CONFigure:CDPower:PCDep:CONTrol:RORDer[?] ***<Result Order>***				Result Order
<Result Order>	Description of parameters	Def. value	Def. unit	FW-Vers.
HADamard | BITReverse	Walsh code channels returned using Hadamard matrix Walsh code channels returned at MSB to LSB	HAD	–	V3.05
Description of command				Sig. State
This command defines the method used to display the code channels. HADamard displays the code channels in order determined by the Hadamard matrix. BITReverse displays the code channels so that the related code channels are adjacent to each other. This setting is only available for Code Domain and Peak Code Domain Error measurement applications.				All

CONFigure:CDPower:PCDep:CONTrol:STATistics[?] ***<Current Statistics>***				Statistic Count
<Current Statistics>	Description of parameters	Def. value	Def. unit	FW-Vers.
1 to 1000	Number of bursts per statistics cycle	100	–	V3.05
Description of command				Sig. State
This command defines the number of bursts forming a statistics cycle.				All

CONFigure:CDPower:PCDep:CONTrol:REPetition[?] ***<Repetition>, <Stop Cond>, <Step Mode>***				Test Cycles
<Repetition>	Description of parameters	Def. value	Def. unit	
1 to 10000 | CONTinuous | SINGleshot | DEFault,	Multiple measurement (counting, until Status = STEP | RDY) Continuous measurement (until STOP or ABORT) Single shot measurement (until Status = RDY) Sets the value to the default setting	SING	–	
<Stop Cond>	Description of parameters	Def. value	Def. unit	
NONE | SONerror | DEFault,	Continue measurement even in case of error Stop measurement in case of error *(stop on error)* Sets the value to the default setting	NONE	–	
<Step Mode>	Description of parameters	Def. value	Def. unit	FW vers.
STEP | NONE | DEFault	Interrupt measurement after each statistics cycle Continue measurement according to its rep. Mode Sets the value to the default setting	NONE	–	V3.05
Description of command				Sig. State
This command determines the repetition mode, stop condition, and stepping mode for the measurement. **Note:** *In the case of READ commands (`READ:...`), the <Repetition> parameter has no effect; the measurement is always stopped after a single shot.*				All

Measured Values – Subsystem CDPower:PCDep

The subsystem *CDPower:PCDep* determines and outputs the results of the Code Domain Error Power. This is the difference between the ideal code domain power and the measured signal.

	I Signal Measurement
READ:ARRay:CDPower:PCDep:ISIGnal[:VALue]:CURRent?	Start single shot meas. and return results
FETCh:ARRay:CDPower:PCDep:ISIGnal[:VALue]:CURRent?	Read meas. results (unsynchronized)
SAMPle:ARRay:CDPower:PCDep:ISIGnal[:VALue]:CURRent?	Read results (synchronized)

Returned values	Description of parameters	Def. value	Def. unit	FW vers.
Walsh code	W_0^{32} to W_{31}^{32} for spreading factor 32 W_0^{16} to W_{31}^{16} for spreading factor 16	NAN		V3.05 V3.20

Description of command	Sig. State
These commands are always queries. They start a measurement and output the levels of the Walsh Code of the in phase signal path (I-signal). The number of values depends on the spreading factor set via `CONFigure:CDPower:PCDep:CONTrol:SFACtor`.	All

	I Signal Measurement
READ:ARRay:CDPower:PCDep:ISIGnal[:VALue]:AVERage?	Start single shot meas. and return results
FETCh:ARRay:CDPower:PCDep:ISIGnal[:VALue]:AVERage?	Read meas. results (unsynchronized)
SAMPle:ARRay:CDPower:PCDep:ISIGnal[:VALue]:AVERage?	Read results (synchronized)

Returned values	Description of parameters	Def. value	Def. unit	FW vers.
Walsh code	W_0^{32} to W_{31}^{32} for spreading factor 32 W_0^{16} to W_{31}^{16} for spreading factor 16	NAN		V3.05 V3.20

Description of command	Sig. State
These commands are always queries. They start a measurement and output the levels of the Walsh Code of the in phase signal path (I-signal). The number of values depends on the spreading factor set via `CONFigure:CDPower:PCDep:CONTrol:SFACtor`.	All

	I Signal Measurement
READ:ARRay:CDPower:PCDep:ISIGnal[:VALue]:MAXimum?	Start single shot meas. and return results
FETCh:ARRay:CDPower:PCDep:ISIGnal[:VALue]:MAXimum?	Read meas. results (unsynchronized)
SAMPle:ARRay:CDPower:PCDep:ISIGnal[:VALue]:MAXimum?	Read results (synchronized)

Returned values	Description of parameters	Def. value	Def. unit	FW vers.
Walsh code	W_0^{32} to W_{31}^{32} for spreading factor 32 W_0^{16} to W_{31}^{16} for spreading factor 16	NAN		V3.05 V3.20

Description of command	Sig. State
These commands are always queries. They start a measurement and output the levels of the Walsh Code of the in phase signal path (I-signal). The number of values depends on the spreading factor set via `CONFigure:CDPower:PCDep:CONTrol:SFACtor`.	All

Q Signal Measurement

READ:ARRay:CDPower:PCDep:QSIGnal[:VALue]:CURRent?	Start single shot meas. and return results
FETCh:ARRay:CDPower:PCDep:QSIGnal[:VALue]:CURRent?	Read meas. results (unsynchronized)
SAMPle:ARRay:CDPower:PCDep:QSIGnal[:VALue]:CURRent?	Read results (synchronized)

Returned values	Description of parameters	Def. value	Def. unit	FW vers.
Walsh code	W_0^{32} to W_{31}^{32} for spreading factor 32 W_0^{16} to W_{31}^{16} for spreading factor 16	NAN		V3.05 V3.20

Description of command	Sig. State
These commands are always queries. They start a measurement and output the levels of the Walsh Code of the quadrature signal path (Q-signal). The number of values depends on the spreading factor set via `CONFigure:CDPower:PCDep:CONTrol:SFACtor`.	All

Q Signal Measurement

READ:ARRay:CDPower:PCDep:QSIGnal[:VALue]:AVERage?	Start single shot meas. and return results
FETCh:ARRay:CDPower:PCDep:QSIGnal[:VALue]:AVERage?	Read meas. results (unsynchronized)
SAMPle:ARRay:CDPower:PCDep:QSIGnal[:VALue]:AVERage?	Read results (synchronized)

Returned values	Description of parameters	Def. value	Def. unit	FW vers.
Walsh code	W_0^{32} to W_{31}^{32} for spreading factor 32 W_0^{16} to W_{31}^{16} for spreading factor 16	NAN		V3.05 V3.20

Description of command	Sig. State
These commands are always queries. They start a measurement and output the levels of the Walsh Code of the quadrature signal path (Q-signal). The number of values depends on the spreading factor set via `CONFigure:CDPower:PCDep:CONTrol:SFACtor`.	All

Q Signal Measurement

READ:ARRay:CDPower:PCDep:QSIGnal[:VALue]:MAXimum?	Start single shot meas. and return results
FETCh:ARRay:CDPower:PCDep:QSIGnal[:VALue]:MAXimum?	Read meas. results (unsynchronized)
SAMPle:ARRay:CDPower:PCDep:QSIGnal[:VALue]:MAXimum?	Read results (synchronized)

Returned values	Description of parameters	Def. value	Def. unit	FW vers.
Walsh code	W_0^{32} to W_{31}^{32} for spreading factor 32 W_0^{16} to W_{31}^{16} for spreading factor 16	NAN		V3.05 V3.20

Description of command	Sig. State
These commands are always queries. They start a measurement and output the levels of the Walsh Code of the quadrature signal path (Q-signal). The number of values depends on the spreading factor set via `CONFigure:CDPower:PCDep:CONTrol:SFACtor`.	All

	Scalar results:
READ[:SCALar]:CDPower:PCDep?	Start single shot measurement and return results
FETCh[:SCALar]:CDPower:PCDep?	Read out measurement results (unsynchronized)
SAMPle[:SCALar]:CDPower:PCDep?	Read out measurement results (synchronized)

Returned values	Description	Def. value	Def. unit	FW vers.
MS Power (x3),	–100.0 dBm to –50.0 dBm	NAN	dBm	V3.05
Carrier Feedthrough (x3),	–120.0 dB to –20.0 dB	NAN	dB	
Frequency Error (x3),	0 to 1000.0 Hz	NAN	Hz	
Rho (x3),	0.0 to 1.0	NAN	–	
Out of Tolerance,	0.0% to 100.0%	NAN	–	
Current Statistics	1 to 10000	NAN	–	

Description of command	Sig. State
These commands are always queries. They start a measurement and output all scalar measurement results. The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average,* and the *MMax* value.	All

CALCulate[:SCALar]:CDPower:PCDep:MATChing:LIMit?				Limit Matching
Returned values	Description	Def. value	Def. unit	FW vers.
PCDep Carrier Feedthrough (x3),	For all values	NAN	–	V3.05
PCDep Frequency Error (x3),			–	
PCDep Rho (x3)	NMAU | NMAL | INV | OK		–	

Description of command	Sig. State
This command is always a query. It indicates whether and in which way the (fixed) limit have been exceeded. The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average,* and the *MMax* value. The following messages may be generated:	All

NMAU	Tolerance value underflow	*not matching, underflow*
NMAL	Tolerance value exceeded	*not matching, overflow*
INV	Measurement invalid	*invalid*
OK	Tolerance value matched	

CALCulate:ARRay:CDPower:PCDep:ISIGnal:CURRent[:RESult]:MATChing:LIMit?				I Signal Tolerance
Returned value	Description	Def. value	Def. unit	FW vers.
32 bit value	Indicator for limit matching in code channel 0 (least significant bit) to 31	NAN	–	V3.05

Description of command	Sig. State
This command is always a query. If a bit is set in the returned value the I signal limit in the corresponding code channel is exceeded.	All

CALCulate:ARRay:CDPower:PCDep:ISIGnal:AVERage[:RESult]:MATChing:LIMit?				I Signal Tolerance
Returned value	Description	Def. value	Def. unit	FW vers.
32 bit value	Indicator for limit matching in code channel 0 (least significant bit) to 31	NAN	–	V3.05

Description of command	Sig. State
This command is always a query. If a bit is set in the returned value the I signal limit in the corresponding code channel is exceeded.	All

CALCulate:ARRay:CDPower:PCDep:ISIGnal:MAXimum[:RESult]:MATChing:LIMit?				I Signal Tolerance
Returned value	**Description**	**Def. value**	**Def. unit**	**FW vers.**
32 bit value	Indicator for limit matching in code channel 0 (least significant bit) to 31	NAN	–	V3.05
Description of command				**Sig. State**
This command is always a query. If a bit is set in the returned value the I signal limit in the corresponding code channel is exceeded.				All

CALCulate:ARRay:CDPower:PCDep:QSIGnal:CURRent[:RESult]:MATChing:LIMit?				Q Signal Tolerance
Returned value	**Description**	**Def. value**	**Def. unit**	**FW vers.**
32 bit value	Indicator for limit matching in code channel 0 (least significant bit) to 31	NAN	–	V3.05
Description of command				**Sig. State**
This command is always a query. If a bit is set in the returned value the Q signal limit in the corresponding code channel is exceeded.				All

CALCulate:ARRay:CDPower:PCDep:QSIGnal:AVERage[:RESult]:MATChing:LIMit?				Q Signal Tolerance
Returned value	**Description**	**Def. value**	**Def. unit**	**FW vers.**
32 bit value	Indicator for limit matching in code channel 0 (least significant bit) to 31	NAN	–	V3.05
Description of command				**Sig. State**
This command is always a query. If a bit is set in the returned value the Q signal limit in the corresponding code channel is exceeded.				All

CALCulate:ARRay:CDPower:PCDep:QSIGnal:MAXimum[:RESult]:MATChing:LIMit?				Q Signal Tolerance
Returned value	**Description**	**Def. value**	**Def. unit**	**FW vers.**
32 bit value	Indicator for limit matching in code channel 0 (least significant bit) to 31	NAN	–	V3.05
Description of command				**Sig. State**
This command is always a query. If a bit is set in the returned value the Q signal limit in the corresponding code channel is exceeded.				All

CDPower:CHPW

The subsystem *CDPower:CHPW* measures the Channel Power measurement. The subsystem corresponds to the measurement menu *Code Domain Power,* application *Channel Power,* and the sections related to this application in the associated popup menu *Code Domain Power Configuration.*

Control of measurement – Subsystem CDPower:CHPW

The subsystem *CDPower:CHPW* controls the channel power measurement.

INITiate:CDPower:CHPW	Start new measurement		⇒ *RUN*
ABORt:CDPower:CHPW	Abort running measurement and switch off		⇒ *OFF*
STOP:CDPower:CHPW	Stop measurement after current stat. cycle		⇒ *STOP*
CONTinue:CDPower:CHPW	Next measurement step (*stepping mode*)		⇒ *RUN*
Description of command		Sig. State	FW vers.
These commands have no query form. They start and stop the channel power measurement, setting it to the status indicated in the top right column.		All	V3.05

CONFigure:CDPower:CHPW:EREPorting[?] ***<Report Mode>***				Event Reporting
<Report Mode>	Description of parameters	Def. value	Def. unit	FW vers.
SRQ | SOPC | SRSQ | OFF	Service request Single operation complete SRQ and SOPC No reporting	OFF	–	V3.05
Description of command				Sig. State
This command defines the events generated when the measurement is terminated or stopped (see *Event Reporting* in Chapter 5 of the CMU manual).				All

CONFigure:CDPower:CHPW:CMAX:LIMit:ASYMmetric[:COMBined][?] **<CHPW Limit Y>**				Limits
<CHPW Limit Y>	Description of parameters	Def. value	Def. unit	FW vers.
–60.0 to 0 | MINimum | MAXimum | DEFault | OFF	Channel power Y limit Sets the value to the range minimum Sets the value to the range maximum Sets the value to the default setting	–23.0	dB	V3.05
Description of command				Sig. State
This command defines the upper limit for the channel power (Y value). The keywords `CMAX` and `AVERage` refer to the *Current* and *Max.* display and for the *Average* display, respectively.				All

CONFigure:CDPower:CHPW:AVERage:LIMit:ASYMmetric[:COMBined][?] **<CHPW Limit Y Average>**				Limits
<CHPW Limit Y Average>	Description of parameters	Def. value	Def. unit	FW vers.
–60.0 to 0 | MINimum | MAXimum | DEFault | OFF	Channel power Y limit Sets the value to the range minimum Sets the value to the range maximum Sets the value to the default setting	–23.0	dB	V3.05
Description of command				Sig. State
This command defines the upper limit for the channel power (Y value). The keywords `CMAX` and `AVERage` refer to the *Current* and *Max.* display and for the *Average* display, respectively.				All

DEFault:CDPower:CHPW:LIMit[?] ***<Enable>***				Default Settings
Enable	Description of parameters	Def. value	Def. unit	FW vers.
ON | OFF	The parameters are set to their default values Some or all parameters are not set to default	ON	–	V3.05
Description of command				Sig. State
If used as a setting command with the parameter *ON,* this command sets all parameters of the subsystem CDPower:CHPW:LIMit to their default values (the setting OFF results in an error message). If used as a query, the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.				All

FETCh[:SCALar]:CDPower:CHPW:STATus?				Measurement Status
Return	Description of parameters	Def. value	Def. unit	FW vers.
OFF | RUN | STOP | ERR | STEP | RDY	Measurement in the OFF state (*RST or ABORt) Running (after INITiate, CONTinue or READ) Stopped (STOP) OFF (could not be started) Stepping mode (<stepmode>=STEP) Stopped according to repetition mode and stop condition	OFF	–	V3.05
1 to 10000 | NONE	Counter for current statistics cycle No counting mode set	NONE	–	
1 to 1000 NONE	Counter for current evaluation period within a cycle Statistic count set to off	NONE	–	
Description of command				Sig. State
This command is always a query. It returns the status of the measurement (see Chapters 3 and 5).				All

Subsystem CDPower:CHPW:CONTrol

The subsystem *CDPower:CHPW:CONTrol* defines the result mode, repetition mode, statistic count, and stop condition of the measurement. These settings are provided in the *Control* tab in the popup menu *Code Domain Power Configuration.*

<table>
<tr><td colspan="4">CONFigure:CDPower:CHPW:CONTrol[?]
<i><Result Mode>, <Current Statistics>, <Repetition>, <Stop Cond>, <Step Mode></i></td><td>Scope of Measurement</td></tr>
<tr><td><Result Mode></td><td>Description of parameters</td><td>Def. value</td><td>Def. unit</td><td></td></tr>
<tr><td>SCALar |</td><td>Scalar values only (incl. ramp matching)</td><td>ARR</td><td>–</td><td></td></tr>
<tr><td>ARRay,</td><td>Scalar measured values and arrays</td><td></td><td></td><td></td></tr>
<tr><td><Current Statistics></td><td>Description of parameters</td><td>Def. value</td><td>Def. unit</td><td></td></tr>
<tr><td>1 to 1000,</td><td>Number of bursts per statistics cycle</td><td>100</td><td>–</td><td></td></tr>
<tr><td><Repetition></td><td>Description of parameters</td><td>Def. value</td><td>Def. unit</td><td></td></tr>
<tr><td>1 to 10000 |</td><td>Multiple measurement
(counting, until Status = STEP | RDY)</td><td>SING</td><td>–</td><td></td></tr>
<tr><td>CONTinuous |</td><td>Continuous measurement (until STOP or ABORT)</td><td></td><td></td><td></td></tr>
<tr><td>SINGleshot |</td><td>Single shot measurement (until Status = RDY)</td><td></td><td></td><td></td></tr>
<tr><td>DEFault,</td><td>Sets the value to the default setting</td><td></td><td></td><td></td></tr>
<tr><td><Stop Cond></td><td>Description of parameters</td><td>Def. value</td><td>Def. unit</td><td></td></tr>
<tr><td>NONE |</td><td>Continue measurement even in case of error</td><td>NONE</td><td>–</td><td></td></tr>
<tr><td>SONerror |</td><td>Stop measurement in case of error <i>(stop on error)</i></td><td></td><td></td><td></td></tr>
<tr><td>DEFault,</td><td>Sets the value to the default setting</td><td></td><td></td><td></td></tr>
<tr><td><Step Mode></td><td>Description of parameters</td><td>Def. value</td><td>Def. unit</td><td>FW-Vers.</td></tr>
<tr><td>STEP |</td><td>Interrupt measurement after each statistics cycle</td><td>NONE</td><td>–</td><td>V3.05</td></tr>
<tr><td>NONE |</td><td>Continue measurement according to its rep. Mode</td><td></td><td></td><td></td></tr>
<tr><td>DEFault</td><td>Sets the value to the default setting</td><td></td><td></td><td></td></tr>
<tr><td colspan="4">Description of command</td><td>Sig. State</td></tr>
<tr><td colspan="4">This command combines the <code>...CONTrol:RMODe</code>, <code>...CONTrol:STATistics</code> and the <code>...CONTrol:REPetition</code> commands, see below.</td><td>All</td></tr>
</table>

<table>
<tr><td colspan="4">CONFigure:CDPower:CHPW:CONTrol:RMODe[?]
<i><Result Mode></i></td><td>Result Mode</td></tr>
<tr><td><Result Mode></td><td>Description of parameters</td><td>Def. value</td><td>Def. unit</td><td>FW-Vers.</td></tr>
<tr><td>SCALar |</td><td>Scalar values only (incl. ramp matching)</td><td>ARR</td><td>–</td><td>V3.05</td></tr>
<tr><td>ARRay</td><td>Scalar measured values and arrays</td><td></td><td></td><td></td></tr>
<tr><td colspan="4">Description of command</td><td>Sig. State</td></tr>
<tr><td colspan="4">This command specifies the type of measured values.</td><td>All</td></tr>
</table>

<table>
<tr><td colspan="4">CONFigure:CDPower:CHPW:CONTrol:STATistics[?]
<i><Current Statistics ></i></td><td>Statistic Count</td></tr>
<tr><td><Current Statistics></td><td>Description of parameters</td><td>Def. value</td><td>Def. unit</td><td>FW-Vers.</td></tr>
<tr><td>1 to 1000</td><td>Number of bursts per statistics cycle</td><td>100</td><td>–</td><td>V3.05</td></tr>
<tr><td colspan="4">Description of command</td><td>Sig. State</td></tr>
<tr><td colspan="4">This command defines the number of bursts forming a statistics cycle.</td><td>All</td></tr>
</table>

CONFigure:CDPower:CHPW:CONTrol:REPetition[?] Test Cycles
<Repetition>, <Stop Cond>, <Step Mode>

<Repetition>	Description of parameters	Def. value	Def. unit	
1 to 10000 |	Multiple measurement (counting, until Status = STEP | RDY)	SING	–	
CONTinuous |	Continuous measurement (until STOP or ABORT)			
SINGleshot |	Single shot measurement (until Status = RDY)			
DEFault,	Sets the value to the default setting			
<Stop Cond>	Description of parameters	Def. value	Def. unit	
NONE |	Continue measurement even in case of error	NONE	–	
SONerror |	Stop measurement in case of error *(stop on error)*			
DEFault,	Sets the value to the default setting			
<Step Mode>	Description of parameters	Def. value	Def. unit	FW vers.
STEP |	Interrupt measurement after each statistics cycle	NONE	–	V3.05
NONE |	Continue measurement according to its rep. Mode			
DEFault	Sets the value to the default setting			
Description of command				Sig. State
This command determines the repetition mode, stop condition, and stepping mode for the measurement. **Note:** *In the case of READ commands (`READ:...`), the <Repetition> parameter has no effect; the measurement is always stopped after a single shot.*				All

Measured Values – Subsystem CDPower:CHPW

The subsystem *CDPower:CHPW* determines and outputs the results of the Channel Power.

I Signal Measurement

READ:ARRay:CDPower:CHPW:ISIGnal[:VALue]:CURRent? Start single shot meas. and return results
FETCh:ARRay:CDPower:CHPW:ISIGnal[:VALue]:CURRent? Read meas. results (unsynchronized)
SAMPle:ARRay:CDPower:CHPW:ISIGnal[:VALue]:CURRent? Read results (synchronized)

Returned values	Value range	Def. value	Def. unit	FW vers.
Walsh code	W_0^{32} to W_{31}^{32}	NAN		V3.05
Description of command				Sig. State
These commands are always queries. They start a measurement and output the levels of the Walsh Code of the in-phase signal path (I-signal).				All

I Signal Measurement

READ:ARRay:CDPower:CHPW:ISIGnal[:VALue]:AVERage? Start single shot meas. and return results
FETCh:ARRay:CDPower:CHPW:ISIGnal[:VALue]:AVERage? Read meas. results (unsynchronized)
SAMPle:ARRay:CDPower:CHPW:ISIGnal[:VALue]:AVERage? Read results (synchronized)

Returned values	Value range	Def. value	Def. unit	FW vers.
Walsh code	W_0^{32} to W_{31}^{32}	NAN		V3.05
Description of command				Sig. State
These commands are always queries. They start a measurement and output the levels of the Walsh Code of the in-phase signal path (I-signal).				All

I Signal Measurement

READ:ARRay:CDPower:CHPW:ISIGnal[:VALue]:MAXimum?	Start single shot meas. and return results
FETCh:ARRay:CDPower:CHPW:ISIGnal[:VALue]:MAXimum?	Read meas. results (unsynchronized)
SAMPle:ARRay:CDPower:CHPW:ISIGnal[:VALue]:MAXimum?	Read results (synchronized)

Returned values	Value range	Def. value	Def. unit	FW vers.
Walsh code	W_0^{32} to W_{31}^{32}	NAN		V3.05

Description of command	Sig. State
These commands are always queries. They start a measurement and output the levels of the Walsh Code of the in-phase signal path (I-signal).	All

Q Signal Measurement

READ:ARRay:CDPower:CHPW:QSIGnal[:VALue]:CURRent?	Start single shot meas. and return results
FETCh:ARRay:CDPower:CHPW:QSIGnal[:VALue]:CURRent?	Read meas. results (unsynchronized)
SAMPle:ARRay:CDPower:CHPW:QSIGnal[:VALue]:CURRent?	Read results (synchronized)

Returned values	Value range	Def. value	Def. unit	FW vers.
Walsh code	W_0^{32} to W_{31}^{32}	NAN		V3.05

Description of command	Sig. State
These commands are always queries. They start a measurement and output the levels of the Walsh Code of the quadrature signal path (Q-signal).	All

Q Signal Measurement

READ:ARRay:CDPower:CHPW:QSIGnal[:VALue]:AVERage?	Start single shot meas. and return results
FETCh:ARRay:CDPower:CHPW:QSIGnal[:VALue]:AVERage?	Read meas. results (unsynchronized)
SAMPle:ARRay:CDPower:CHPW:QSIGnal[:VALue]:AVERage?	Read results (synchronized)

Returned values	Value range	Def. value	Def. unit	FW vers.
Walsh code	W_0^{32} to W_{31}^{32}	NAN		V3.05

Description of command	Sig. State
These commands are always queries. They start a measurement and output the levels of the Walsh Code of the quadrature signal path (Q-signal).	All

Q Signal Measurement

READ:ARRay:CDPower:CHPW:QSIGnal[:VALue]:MAXimum?	Start single shot meas. and return results
FETCh:ARRay:CDPower:CHPW:QSIGnal[:VALue]:MAXimum?	Read meas. results (unsynchronized)
SAMPle:ARRay:CDPower:CHPW:QSIGnal[:VALue]:MAXimum?	Read results (synchronized)

Returned values	Value range	Def. value	Def. unit	FW vers.
Walsh code	W_0^{32} to W_{31}^{32}	NAN		V3.05

Description of command	Sig. State
These commands are always queries. They start a measurement and output the levels of the Walsh Code of the quadrature signal path (Q-signal).	All

Scalar results:

READ[:SCALar]:CDPower:CHPW? **FETCh[:SCALar]:CDPower:CHPW?** **SAMPle[:SCALar]:CDPower:CHPW?**	Start single shot measurement and return results Read out measurement results (unsynchronized) Read out measurement results (synchronized)			
Returned values	**Value range**	**Def. value**	**Def. unit**	**FW vers.**
MS Power (x3),	–100.0 dBm to –50.0 dBm	NAN	dBm	V3.05
Carrier Feedthrough (x3),	–120.0 dB to –20.0 dB	NAN	dB	
Frequency Error (x3),	0 to 1000.0 Hz	NAN	Hz	
Rho (x3),	0.0 to 1.0	NAN	–	
Out of Tolerance,	0.0% to 100.0%	NAN	%	
Current Statistics	1 to 1000	NAN	–	
Description of command				**Sig. State**
These commands are always queries. They start a measurement and output all scalar measurement results. The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average*, and the *MMax* value.				All

CALCulate:ARRay:CDPower:CHPW:ISIGnal:CURRent[:RESult]:MATChing:LIMit?	I Signal Tolerance			
Returned value	**Description**	**Def. value**	**Def. unit**	**FW vers.**
32 bit value	Indicator for limit matching in code channel 0 (least significant bit) to 31	NAN	–	V3.20
Description of command				**Sig. State**
This command is always a query. If a bit is set in the returned value the I signal limit in the corresponding code channel is exceeded.				All

CALCulate:ARRay:CDPower:CHPW:ISIGnal:AVERage[:RESult]:MATChing:LIMit?	I Signal Tolerance			
Returned value	**Description**	**Def. value**	**Def. unit**	**FW vers.**
32 bit value	Indicator for limit matching in code channel 0 (least significant bit) to 31	NAN	–	V3.20
Description of command				**Sig. State**
This command is always a query. If a bit is set in the returned value the I signal limit in the corresponding code channel is exceeded.				All

CALCulate:ARRay:CDPower:CHPW:ISIGnal:MAXimum[:RESult]:MATChing:LIMit?	I Signal Tolerance			
Returned value	**Description**	**Def. value**	**Def. unit**	**FW vers.**
32 bit value	Indicator for limit matching in code channel 0 (least significant bit) to 31	NAN	–	V3.20
Description of command				**Sig. State**
This command is always a query. If a bit is set in the returned value the I signal limit in the corresponding code channel is exceeded.				All

CALCulate:ARRay:CDPower:CHPW:QSIGnal:CURRent[:RESult]:MATChing:LIMit?	Q Signal Tolerance			
Returned value	**Description**	**Def. value**	**Def. unit**	**FW vers.**
32 bit value	Indicator for limit matching in code channel 0 (least significant bit) to 31	NAN	–	V3.20
Description of command				**Sig. State**
This command is always a query. If a bit is set in the returned value the Q signal limit in the corresponding code channel is exceeded.				All

CALCulate:ARRay:CDPower:CHPW:QSIGnal:AVERage[:RESult]:MATChing:LIMit?				Q Signal Tolerance
Returned value	Description	Def. value	Def. unit	FW vers.
32 bit value	Indicator for limit matching in code channel 0 (least significant bit) to 31	NAN	–	V3.20
Description of command				Sig. State
This command is always a query. If a bit is set in the returned value the Q signal limit in the corresponding code channel is exceeded.				All

CALCulate:ARRay:CDPower:CHPW:QSIGnal:MAXimum[:RESult]:MATChing:LIMit?				Q Signal Tolerance
Returned value	Description	Def. value	Def. unit	FW vers.
32 bit value	Indicator for limit matching in code channel 0 (least significant bit) to 31	NAN	–	V3.20
Description of command				Sig. State
This command is always a query. If a bit is set in the returned value the Q signal limit in the corresponding code channel is exceeded.				All

CALCulate[:SCALar]:CDPower:CHPW:MATChing:LIMit?				Limit Matching
Returned values	Value range	Def. value	Def. unit	FW vers.
CHP Carrier Feedthrough (x3), CHP Frequency Error (x3), CHP Rho (x3)	For all values NMAU | NMAL | INV | OK	INV INV INV	– – –	V3.05
Description of command				Sig. State
This command is always a query. It indicates whether and in which way the (fixed) limit lines have been exceeded. The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average,* and the *MMax* value. The following messages may be generated: NMAU Tolerance value underflow *not matching, underflow* NMAL Tolerance value exceeded *not matching, overflow* INV Measurement invalid *invalid* OK Tolerance value matched				All

Receiver Quality Measurements

The subsystem *Receiver Quality* measures the receiver quality of the CDMA mobile phone. The settings are used to assess the quality of transmission between the CMU and the device under test. The subsystem corresponds to the main menu *Receiver Quality* and the associated popup menu *Receiver Quality Configuration.*

Note: *In order to perform channel quality and receiver quality measurements and obtain meaningful results, an appropriate test setup is required (see application examples in Chapter 2 of this manual). Consequently, for these types of measurements, the Call Established (CEST) signalling state must be reached before any of the commands retrieving test results* (`READ...?`, `FETCh...?`, `SAMPle...?`, *or* `CALCulate...LIMit?`) *can be used. Test configurations, however, can be defined any time.*

RXQuality:FER (Frame Erasure Rate)

The subsystem *RXQuality:FER* contains the commands for receiver quality measurements. The subsystem corresponds to the main menu *Receiver Quality* and the corresponding sections of the associated popup menu *Receiver Quality Configuration.*

Note: *Receiver Quality commands define both the fundamental and supplemental channels of the traffic channel. The GPIB command abbreviations represent the following channels:*

FCH	*GPIB commands for the Fundamental traffic channel*
SCH/SCCH	*GPIB commands for the Supplemental (code) channel*
FSSCommon	*GPIB commands affecting the Fundamental and Supplemental (code) channels (FCH and SCH/SCCH)*

Common Settings – Subsystem RXQuality:FER:FSSCommon:TSETup<nr>

This subsystem selects one out of 5 test setups. It corresponds to the hotkeys associated to the *Test Setup* softkey.

CONFigure:RXQuality:FER:FSSCommon:TSETup[?] ***<Test Setup>*** Test Setup

<Test Setup>	Description of parameters	Def. value	Def. unit	FW vers.
T1 |	Test Setup 1: Sensitivity	T3	–	V3.05
T2 |	Test Setup 2: Dynamic range			
T3 |	Test Setup 3: Traffic channel demodulation			
T4 |	Test Setup 4: User 1			
T5 |	Test Setup 5: User 2			
DEFault	Sets the value to the default setting			

Description of command	Sig. State
This command selects one out of 5 test setups, i.e. one data set parametrizing a particular receiver quality measurement. When a test setup is switched over, the running measurement is stopped and all measured values are set invalid.	CEST

Measurement Environment – Subsystem RXQuality:FER:FSSCommon:TSETup<nr>

The subsystem *RXQuality:FER:FSSCommon:TSETup<nr>:ENVironment…* configures the generated RF signal. It corresponds to the *Measurement Environment* section in the *Control* tab of the *Receiver Quality Configuration* menu. The settings are used only if the environment is enabled; see `CONFigure:RXQuality:FER:FSSCommon:TSETup<nr>:ENVironment:ENABle`.

CONFigure:RXQuality:FER:FSSCommon:TSETup<nr>:ENVironment:ENABle[?] ***<Enable>***				Environment Enable
<Enable>	Description of parameters	Def. Value	Def. Unit	FW vers.
ON | OFF	Enable or disable environment	ON	–	V3.20
Description of command				Sig. State
This command enables or disables the environment for an individual test setup <nr> (<nr> = 1 to 5) *Receiver Quality* measurement applications.				All

CONFigure:RXQuality:FER:FSSCommon:TSETup<nr>:ENVironment:POWer:CDMA[?] **<CDMA Power>**				CDMA Power
<CDMA Power>	Description of parameters	Def. value	Def. unit	FW vers.
–120.0 dBm to –33.0 dBm | –120.0 dBm to –16.0 dBm | –100.0 dBm to +7.0 dBm | DEFault | MINimum | MAXimum	RF1 OUT, 0 dB ext. atten RF2 OUT, 0 dB ext. atten RF3 OUT, 0 dB ext. atten Sets the value to the default setting Sets the value to the range minimum Sets the value to the range maximum	–104.0 (1) –25.0 (2) –75.0 (3) –70.0 (4) –70.0 (5)	dBm dBm dBm dBm dBm	V3.20
Description of command				Sig. State
This command determines the total CDMA output power (absolute value, in dBm) of the CMU. The CDMA Power value range depends on the RF input used and the external attenuation set. The suffix <nr> refers to the selected test setup (<nr> = 1 to 5); the range is the same for all test setups but not the default values.				All

CONFigure:RXQuality:FER:FSSCommon:TSETup<nr>:ENVironment:LEVel:FPICh[?] ***<Pilot Level>***				F-PICH Level
<Pilot Level>	Description of parameters	Def. value	Def. unit	FW vers.
–20.0 dB to –7.0 dB | OFF	Pilot Level F-PICH switched off	–7.0 (All)	dB	V3.20
Description of command				Sig. State
This command determines the level in the forward pilot channel of the CMU. The channel power is in units relative to the total CDMA power. The suffix <nr> refers to the selected test setup (<nr> = 1 to 5); the range and the default values are the same for all test setup.				All

CONFigure:RXQuality:FER:FSSCommon:TSETup<nr>:ENVironment:LEVel:FFCH[?] F-FCH Level
<FCH Level>

<FCH Level>	Description of parameters	Def. value	Def. unit	FW vers.
–20.0 dB to –7.0 dB | OFF	FCH Level F-FCH switched off	–15.6 (1) –15.6 (2) –14.0 (3) –14.0 (4) –14.0 (5)	dB	V3.20

Description of command	Sig. State
This command determines the level in the forward fundamental channel of the CMU. The channel power is in units relative to the total CDMA power. The suffix <nr> refers to the selected test setup (<nr> = 1 to 5); the range is the same for all test setups but not the default values.	All

CONFigure:RXQuality:FER:FSSCommon:TSETup<nr>:ENVironment:LEVel:FSCH:ZERO[?] F-SCH0 Level
<SCH0 Level>

<SCH0 Level>	Description of parameters	Def. value	Def. unit	FW vers.
–20.0 dB to –7.0 dB | OFF	F-SCH0 Level F-SCH0 switched off	–13.5 (1) –13.5 (2) –14.0 (3) –14.0 (4) –14.0 (5)	dB	V3.20

Description of command	Sig. State
This command determines the level in the forward SCH0 channel of the CMU. The channel power is in units relative to the total CDMA power. The suffix <nr> refers to the selected test setup (<nr> = 1 to 5); the range is the same for all test setups but not the default values.	All

CONFigure:RXQuality:FER:FSSCommon:TSETup<nr>:ENVironment:LEVel:FSCH:ONE[?] F-SCH1 Level
<SCH1 Level>

<SCH1 Level>	Description of parameters	Def. value	Def. unit	FW vers.
–20.0 dB to –7.0 dB | OFF	F-SCH1 Level F-SCH1 switched off	–13.5 (1) –13.5 (2) –14.0 (3) –14.0 (4) –14.0 (5)	dB	V3.20

Description of command	Sig. State
This command determines the level in the forward SCH1 channel of the CMU. The channel power is in units relative to the total CDMA power. The suffix <nr> refers to the selected test setup (<nr> = 1 to 5); the range is the same for all test setups but not the default values.	All

CONFigure:RXQuality:FER:FSSCommon:TSETup<nr>:ENVironment:EBNT:FFCH? F-FCH Eb/Nt
<Eb/Nt>

<Eb/Nt>	Description of parameters	Def. value	Def. unit	FW vers.
–30.969 dB to 18.072 dB	Calculated F-FCH Eb/Nt	–	dB	V3.20

Description of command	Sig. State
This command is always a query. It returns the calculated signal to noise ratio for the forward FCH. This quantity is undefined unless the AWGN generator is turned on (`CONFigure:RXQuality:FER:FSSCommon:TSETup<nr>:ENVironment:IMPairments:LEVel:AWGN`). The suffix <nr> refers to the selected test setup (<nr> = 1 to 5). The quoted range of values is valid for data rates between 9.6 kbps and 153.6 kbps; see *Eb/Nt Calculation* in Chapter 4.	All

CONFigure:RXQuality:FER:FSSCommon:TSETup<nr>:ENVironment:EBNT:FSCH:ZERO? F-SCH0 Eb/Nt
<Eb/Nt>

<Eb/Nt>	Description of parameters	Def. value	Def. unit	FW vers.
–30.969 dB to 18.072 dB	Calculated F-SCH0 Eb/Nt	–	dB	V3.20

Description of command	Sig. State
This command is always a query. It returns the calculated signal to noise ratio for the forward SCH0. This quantity is undefined unless the AWGN generator is turned on (`CONFigure:RXQuality:FER:FSSCommon:TSETup<nr>:ENVironment:IMPairments:LEVel:AWGN`). The suffix <nr> refers to the selected test setup (<nr> = 1 to 5). The quoted range of values is valid for data rates between 9.6 kbps and 153.6 kbps; see *Eb/Nt Calculation* in Chapter 4.	All

CONFigure:RXQuality:FER:FSSCommon:TSETup<nr>:ENVironment:EBNT:FSCH:ONE? F-SCH1 Eb/Nt
<Eb/Nt>

<Eb/Nt>	Description of parameters	Def. value	Def. unit	FW vers.
–30.969 dB to 18.072 dB	Calculated F-SCH1 Eb/Nt	–	dB	V3.20

Description of command	Sig. State
This command is always a query. It returns the calculated signal to noise ratio for the forward SCH1. This quantity is undefined unless the AWGN generator is turned on (`CONFigure:RXQuality:FER:FSSCommon:TSETup<nr>:ENVironment:IMPairments:LEVel:AWGN`). The suffix <nr> refers to the selected test setup (<nr> = 1 to 5). The quoted range of values is valid for data rates between 9.6 kbps and 153.6 kbps; see *Eb/Nt Calculation* in Chapter 4.	All

CONFigure:RXQuality:FER:FSSCommon:TSETup<nr>:ENVironment:FRATe:FFCH[?] Frame Rate
<Frame Rate>

<Frame Rate>	Description of parameters	Def. value	Def. unit	FW vers.
EIGHth | QUARter | HALF | FULL | DEFault	Frames at 1/8 of the rate set Frames at 1/4 of the rate set Frames at 1/2 of the rate set Frames at the full rate set	FULL	–	V3.20

Description of command	Sig. State
This command sets the frame rate for the variable rate traffic channel. The suffix <nr> refers to the selected test setup (<nr> = 1 to 5). The range and default value is the same for all test setups.	All

CONFigure:RXQuality:FER:FSSCommon:TSETup<nr>:ENVironment:IMPairments:AWGN[?] AWGN Level
<AWGN Level>

<AWGN Level>	Description of parameters	Def. value	Def. unit	FW vers.
–20.0 dB to +4.0 dB | DEFault | MINimum | MAXimum | OFF,	AWGN level Sets the value to the default setting Sets the value to the range minimum Sets the value to the range maximum	OFF (1) OFF (2) –1.0 (3) OFF (4) OFF (5)	dB	V3.20

Description of command	Sig. State
This command determines an Additional White Gaussian Noise level to impair the CMU output signal. The suffix <nr> refers to the selected test setup (<nr> = 1 to 5); the range is the same for all test setups but not the default values.	All

CONFigure:RXQuality:FER:FSSCommon:TSETup<nr>:ENVironment:IMPairments:FOFFset[?] BS Frequency Offset
<BS Freq Offset>

<BS Freq Offset>	Description of parameters	Def. value	Def. unit	FW vers.
–50.0 kHz to +50.0 kHz | DEFault | MINimum | MAXimum | OFF	BS frequency offset Sets the value to the default setting Sets the value to the range minimum Sets the value to the range maximum	OFF (All)	Hz	V3.20

Description of command	Sig. State
This command determines a frequency offset to impair the CMU output signal. The suffix <nr> refers to the selected test setup (<nr> = 1 to 5). The range and default value is the same for all test setups.	All

CONFigure:RXQuality:FER:FSSCommon:TSETup<nr>:ENVironment:IMPairments:ITFer[?] Injected Tx FER
<FER>

<FER>	Description of parameters	Def. value	Def. unit	FW vers.
0% to 50% | OFF | ON	Injected Tx FER Switch FER injection off (equiv. to 0%) Re-activate FER injection, using the previously defined value	OFF (All)	–	V3.20

Description of command	Sig. State
This command defines a percentage of faulty (i.e. erasure) frames that the CMU injects into all traffic channels of its BS Signal. The suffix <nr> refers to the selected test setup (<nr> = 1 to 5). The range and default value is the same for all test setups.	All

CONFigure:RXQuality:FER:FSSCommon:TSETup<nr>:ENVironment:PCBits? Power Control Bits

Response	Description of parameters	Def. value	Def. unit	FW vers.
AUT	Auto mode, closed-loop operation	AUT	–	V3.20

Description of command	Sig. State
This command is always a query and returns the power control bit sequence that the CMU sends to the mobile station to control its output power.	All

Control of Measurement – Subsystem RXQuality:FER

The subsystem *RXQuality:FER* controls the receiver quality measurements.

INITiate:RXQuality:FER:FCH **INITiate:RXQuality:FER:SCHScch**	Start new measurement	⇒ RUN
ABORt:RXQuality:FER:FCH **ABORt:RXQuality:FER:SCHScch**	Abort running measurement and switch off	⇒ OFF
STOP:RXQuality:FER:FCH **STOP:RXQuality:FER:SCHScch**	Stop measurement	⇒ STOP
CONTinue:RXQuality:FER:FCH **CONTinue:RXQuality:FER:SCHScch**	Next measurement step (stepping mode)	⇒ RUN

Description of command	Sig. State	FW vers.
These commands do not exist as queries. They start or stop the current measurement, setting it to the status indicated.	All	V3.05

CONFigure:RXQuality:FER:FCH:EREPorting[?] **CONFigure:RXQuality:FER:SCHScch:EREPorting[?]** ***<Report Mode>***				Event Reporting
<Report Mode>	**Description of parameters**	**Def. value**	**Def. unit**	**FW vers.**
SRQ | SOPC | SRSQ | OFF | DEFault	Service request Single operation complete SRQ and SRSQ No reporting Sets the value to the default setting	OFF	–	V3.05
Description of command				**Sig. State**
This command defines the events generated when the measurement is terminated or stopped (see *Event Reporting* in Chapter 5 of the CMU manual).				All

FETCh[:SCALar]:RXQuality:FER:FCH:STATus? **FETCh[:SCALar]:RXQuality:FER:SCHScch:STATus?**				Measurement Status
Return	**Description of parameters**	**Def. value**	**Def. unit**	**FW vers.**
OFF | RUN | STOP | ERR | STEP | RDY	Measurement in the OFF state (*RST or ABORt) Running (after INITiate, CONTinue or READ) Stopped (STOP) OFF (could not be started) Stepping mode (<stepmode>=STEP) Stopped according to repetition mode and stop condition	OFF	–	V3.05
1 to 10000 | NONE	Counter for current statistics cycle No counting mode set	NONE	–	
1 to 1000 NONE	Counter for current evaluation period within a cycle Statistic count set to off	NONE	–	
Description of command				**Sig. State**
This command is always a query. It returns the status of the measurement.				All

XTND:RXQuality:FER:SCHScch:SCH:ONE[?] ***<Enable>***				SCH1 Extension
<Min Confidence Level>	**Description of parameters**	**Def. value**	**Def. unit**	**FW vers.**
ON | OFF	SCH1 results included SCH1 results not included	OFF	–	V3.20
Description of command				**Sig. State**
This command extends the output arrays of the `READ...`, `FETCh...`, `SAMPle[:SCALar]:RXQuality:FER:SCHScch?` commands and the `CALCulate[:SCALar]:RXQuality:FER:SCHScch:MATChing:LIMit?` command to include the results for the SCH1.				All

Subsystem RXQuality:FER:CONTrol

The subsystem *RXQuality:FER:CONTrol* sets the control parameters for the receiver quality measurements. The subsystem corresponds to the tab *Control* in the popup menu *Receiver Quality Configuration.*

CONFigure:RXQuality:FER:FCH:CONTrol:TSETup<nr>:FRAMes[?] **CONFigure:RXQuality:FER:SCHScch:CONTrol:TSETup<nr>:FRAMes[?]** ***<Frame Count>***				Max. Number of Frames
<Frame Count>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 100000 | MINimum | MAXimum | DEFault	Maximum number of frames to be sent Sets the value to the range minimum Sets the value to the range maximum Sets the value to the default setting	1000	–	V3.05
Description of command				Sig. State
This command defines the maximum number of frames to be sent for the measurement. The suffix <nr> refers to the selected test setup (<nr> = 1 to 5); the range and the default value is the same for all test setups.				All

CONFigure:RXQuality:FER:FCH:CONTrol:TSETup<nr>:REPetition[?] **CONFigure:RXQuality:FER:SCHScch:CONTrol:TSETup<nr>:REPetition[?]** ***<Repetition>, <Stop Cond>, <Step Mode>***				Test Cycles
<Repetition>	Description of parameters	Def. value	Def. unit	
CONTinuous | SINGleshot | 1 to 10000 | DEFault,	Continuous measurement (until STOP or ABORT) Single shot measurement (until Status = RDY) Multiple measurement (counting, until Status = STEP | RDY) Sets the value to the default setting	SING	–	
<Stop Cond>	Description of parameters	Def. value	Def. unit	
NONE | ALEX | CLEX | FLEX | DEFault,	Not aborted, measurement over all frames Measurement aborted if any limit is exceeded Measurement aborted if confidence level limit is exceeded Measurement aborted if frame limit is exceeded Sets the value to the default setting	NONE	–	
<Step Mode>	Description of parameters	Def. value	Def. unit	FW vers.
STEP | NONE | DEFault	Interrupt measurement after each statistics cycle Continue measurement according to its rep. mode Sets the value to the default setting	NONE	–	V3.05
Description of command				Sig. State
This command defines the repetition mode, stop condition, and stepping mode for the measurement. The suffix <nr> refers to the selected test setup (<nr> = 1 to 5); the range and the default value is the same for all test setups.				All

Subsystem RXQuality:FER:FCH:LIMit

The subsystem *RXQuality:FER:FCH:LIMit* defines tolerance values for the receiver quality measurements. The subsystem corresponds to the tab *Limits* in the popup menu *Receiver Quality Configuration.*

DEFault:RXQuality:FER:FCH:LIMit:TSETup<nr>[?] Limit Default Settings
DEFault:RXQuality:FER:SCHScch:LIMit:TSETup<nr>[?]
<Enable>

Enable	Description of parameters	Def. value	Def. unit	FW vers.
ON | OFF	The parameters are set to their default values Some or all parameters are not set to default	ON	–	V3.05

Description of command	Sig. State
If used as a setting command with the parameter *ON,* this command sets all parameters of the subsystem OVERview:CQUality:LIMit to their default values (the setting OFF results in an error message). The suffix <nr> refers to the selected test setup (<nr> = 1 to 5). If used as a query, the command returns whether all parameters are set to their default values *(ON)* or not *(OFF).*	All

CONFigure:RXQuality:FER:FCH:LIMit:TSETup<nr>:MFER[?] Max. FER, FCH
CONFigure:RXQuality:FER:SCHScch:LIMit:TSETup<nr>:MFER[?]
<Max FER Limit>

<Max FER Limit>	Description of parameters	Def. value	Def. unit	FW vers.
0.1 % to 50.0 % | MINimum | MAXimum | DEFault | ON | OFF	Maximum Frame Error Rate Sets the value to the range minimum Sets the value to the range maximum Sets the value to the default setting	0.5	%	V3.05

Description of command	Sig. State
This command defines the tolerances for the receiver quality measurement for test setup <nr> (1 to 5). The range and default value is the same for all test setups.	All

CONFigure:RXQuality:FER:SCHScch:LIMit:TSETup<nr>:SCH:ZERO:MFER[?] Max. FER, SCH
CONFigure:RXQuality:FER:SCHScch:LIMit:TSETup<nr>:SCH:ONE:MFER[?]
<Max FER Limit>

<Max FER Limit>	Description of parameters	Def. value	Def. unit	FW vers.
0.1 % to 100.0 % | MINimum | MAXimum | DEFault | ON | OFF	Maximum Frame Error Rate Sets the value to the range minimum Sets the value to the range maximum Sets the value to the default setting	0.5	%	V3.20

Description of command	Sig. State
This command defines the tolerances for the FER on the SCHs for test setup <nr> (1 to 5). The range and default value is the same for all test setups.	All

CONFigure:RXQuality:FER:FCH:LIMit:TSETup<nr>:CLEVel[?]
CONFigure:RXQuality:FER:SCHScch:LIMit:TSETup<nr>:CLEVel[?]
<Min Confidence Level>

Min. Confidence Level

<Min Confidence Level>	Description of parameters	Def. value	Def. unit	FW vers.
85.0 % to 99.99 % |	Minimum Confidence Level	95.0	%	V3.05
MINimum |	Sets the value to the range minimum			
MAXimum |	Sets the value to the range maximum			
DEFault |	Sets the value to the default setting			
ON |				
OFF				

Description of command	Sig. State
This command defines the tolerances for the receiver quality measurement for test setup <nr> (1 to 5). The ranges and default values are the same for all test setups.	All

CONFigure:RXQuality:FER:SCHScch:LIMit:TSETup<nr>SCH:ZERO:CLEVel[?]
CONFigure:RXQuality:FER:SCHScch:LIMit:TSETup<nr>SCH:ONE:CLEVel[?]
<Min Confidence Level>

Min. Confidence Level

<Min Confidence Level>	Description of parameters	Def. value	Def. unit	FW vers.
85.0 % to 99.99 % |	Minimum Confidence Level	95.0	%	V3.20
MINimum |	Sets the value to the range minimum			
MAXimum |	Sets the value to the range maximum			
DEFault |	Sets the value to the default setting			
ON |				
OFF				

Description of command	Sig. State
This command defines the tolerances for the minimum confidence level on the SCHs for test setup <nr> (1 to 5). The ranges and default values are the same for all test setups.	All

Measured Values – Subsystem RXQuality:FER

The subsystem *RXQuality:FER* measures and outputs the bit error rate and compares it with the tolerance values. The subsystem corresponds to the output fields in the *Receiver Quality* menu.

Scalar Results:

READ[:SCALar]:RXQuality:FER:FCH?
READ[:SCALar]:RXQuality:FER:SCHScch? Start single shot measurement and return results
FETCh[:SCALar]:RXQuality:FER:FCH?
FETCh[:SCALar]:RXQuality:FER:SCHScch? Read out meas. results (unsynchronized)
SAMPle[:SCALar]:RXQuality:FER:FCH?
SAMPle[:SCALar]:RXQuality:FER:SCHScch? Read out measurement results (synchronized)

Returned values	Value range	Def. value	Def. unit	FW vers.
Frame Error Rate (FER) for SCH0, Frame Errors (abs) for SCH0, Elapsed Frames for SCH0, Confidence Level for SCH0,	0.0% to 100.0% 0 to 20000 0 to 20000 0.000% to 100.000%	NAN NAN NAN NAN	% – – %	V3.05
Frame Error Rate (FER) for SCH1, Frame Errors (abs) for SCH1, Elapsed Frames for SCH1, Confidence Level for SCH1	0.0% to 100.0% 0 to 20000 0 to 20000 0.000% to 100.000%	NAN NAN NAN NAN	% – – %	V3.20

Description of command	Sig. State
These commands are always queries. They start a receiver quality measurement and output the measurement results (see also detailed explanation of measured values in Chapter 4). The SCH1 results are included only if the output is explicitly enabled (`XTND:RXQuality:FER:SCHScch:SCH:ONE ON`).	All

CALCulate[:SCALar]:RXQuality:FER:FCH:MATChing:LIMit? Limit Matching
CALCulate[:SCALar]:RXQuality:FER:SCHScch:MATChing:LIMit?

Returned values	Description of parameters	Def. value	Def. unit	FW vers.
Maximum FER for SCH0, Confidence Level for SCH0,	For all measured values: NMAU | NMAL | INV | OK	INV INV	– –	V3.05
Maximum FER for SCH1, Confidence Level for SCH1	For all measured values: NMAU | NMAL | INV | OK	INV INV	– –	V3.20

Description of command	Sig. State
This command is always a query. It indicates whether and in which way the permissible error limits for the measured values of the bit error rate test (see command above) have been exceeded. The SCH1 results are included only if the output is explicitly enabled (`XTND:RXQuality:FER:SCHScch:SCH:ONE ON`).	All

The following messages can be output for the measured quantities:

NMAU	Underflow of tolerance value	not matching, underflow
NMAL	Tolerance value exceeded	not matching, overflow
INV	Measurement invalid	invalid
OK	All tolerances matched	

RXQuality:FPC (Forward Power Control)

The subsystem *RXQuality:FPC* contains the commands for receiver quality measurements. The subsystem corresponds to the main menu *Receiver Quality* and the corresponding sections of the associated popup menu *Receiver Quality Configuration.*

Measurement Environment – Subsystem RXQuality:FER:FSSCommon:TSETup<nr>

The subsystem *RXQuality:FPControl:ENVironment...* configures the generated RF signal. It corresponds to the *Measurement Environment* section in the *Control* tab of the *Receiver Quality Configuration* menu. The settings are used only if the environment is enabled; see `CONFigure:RXQuality:FPControl:ENVironment:ENABle`.

CONFigure:RXQuality:FPControl:ENVironment:ENABle[?] ***<Enable>***				Environment Enable
<Enable>	Description of parameters	Def. Value	Def. Unit	FW vers.
ON | OFF	Enable or disable environment	ON	–	V3.20
Description of command				Sig. State
This command enables or disables the environment for the *Forward Power Control* application.				All

CONFigure:RXQuality:FPControl:ENVironment:POWer:CDMA[?] **<CDMA Power>**				CDMA Power
<CDMA Power>	Description of parameters	Def. value	Def. unit	FW vers.
–120.0 dBm to –33.0 dBm | –120.0 dBm to –16.0 dBm | –100.0 dBm to +7.0 dBm | DEFault | MINimum | MAXimum	RF1 OUT, 0 dB ext. atten RF2 OUT, 0 dB ext. atten RF3 OUT, 0 dB ext. atten Sets the value to the default setting Sets the value to the range minimum Sets the value to the range maximum	–50.0	dBm	V3.20
Description of command				Sig. State
This command determines the total CDMA output power (absolute value, in dBm) of the CMU. The CDMA Power value range depends on the RF input used and the external attenuation set.				All

CONFigure:RXQuality:FPControl:ENVironment:LEVel:FPICh[?] ***<Pilot Level>***				F-PICH Level
<Pilot Level>	Description of parameters	Def. value	Def. unit	FW vers.
–20.0 dB to –7.0 dB | OFF	Pilot Level F-PICH switched off	–7.0	dB	V3.20
Description of command				Sig. State
This command determines the level in the forward pilot channel of the CMU. The channel power is in units relative to the total CDMA power.				All

CONFigure:RXQuality:FPControl:ENVironment:LEVel:FFCH[?] F-FCH Level
<FCH Level>

<FCH Level>	Description of parameters	Def. value	Def. unit	FW vers.
–20.0 dB to –7.0 dB | OFF	FCH Level F-FCH switched off	–15.6	dB	V3.20

Description of command	Sig. State
This command determines the level in the forward fundamental channel of the CMU. The channel power is in units relative to the total CDMA power.	All

CONFigure:RXQuality:FPControl:ENVironment:LEVel:FSCH:ZERO[?] F-SCH0 Level
<SCH0 Level>

<SCH0 Level>	Description of parameters	Def. value	Def. unit	FW vers.
–20.0 dB to –7.0 dB | OFF	F-SCH0 Level F-SCH0 switched off	–13.5	dB	V3.20

Description of command	Sig. State
This command determines the level in the forward SCH0 channel of the CMU. The channel power is in units relative to the total CDMA power.	All

CONFigure:RXQuality:FPControl:ENVironment:LEVel:FSCH:ONE[?] F-SCH1 Level
<SCH1 Level>

<SCH1 Level>	Description of parameters	Def. value	Def. unit	FW vers.
–20.0 dB to –7.0 dB | OFF	F-SCH1 Level F-SCH1 switched off	–13.5	dB	V3.20

Description of command	Sig. State
This command determines the level in the forward SCH1 channel of the CMU. The channel power is in units relative to the total CDMA power.	All

CONFigure:RXQuality:FPControl:ENVironment:FRATe:FFCH[?] Frame Rate
<Frame Rate>

<Frame Rate>	Description of parameters	Def. value	Def. unit	FW vers.
EIGHth | QUARter | HALF | FULL | DEFault	Frames at 1/8 of the rate set Frames at 1/4 of the rate set Frames at 1/2 of the rate set Frames at the full rate set	FULL	–	V3.20

Description of command	Sig. State
This command sets the frame rate for the variable rate traffic channel.	All

CONFigure:RXQuality:FPControl:ENVironment:IMPairments:AWGN[?] AWGN Level
<AWGN Level>

<AWGN Level>	Description of parameters	Def. value	Def. unit	FW vers.
–20.0 dB to +4.0 dB | DEFault | MINimum | MAXimum | OFF,	AWGN level Sets the value to the default setting Sets the value to the range minimum Sets the value to the range maximum	OFF	dB	V3.20

Description of command	Sig. State
This command determines an Additional White Gaussian Noise level to impair the CMU output signal.	All

CONFigure:RXQuality:FPControl:ENVironment:IMPairments:FOFFset[?] BS Frequency Offset
<BS Freq Offset>

<BS Freq Offset>	Description of parameters	Def. value	Def. unit	FW vers.
–50.0 kHz to +50.0 kHz | DEFault | MINimum | MAXimum | OFF	BS frequency offset Sets the value to the default setting Sets the value to the range minimum Sets the value to the range maximum	OFF	Hz	V3.20

Description of command	Sig. State
This command determines a frequency offset to impair the CMU output signal.	All

CONFigure:RXQuality:FPControl:ENVironment:IMPairments:ITFer[?] Injected Tx FER
<FER>

<FER>	Description of parameters	Def. value	Def. unit	FW vers.
0% to 50% | OFF | ON	Injected Tx FER Switch FER injection off (equiv. to 0%) Re-activate FER injection, using the previously defined value	OFF	–	V3.20

Description of command	Sig. State
This command defines a percentage of faulty (i.e. erasure) frames that the CMU injects into all traffic channels of its BS Signal.	All

CONFigure:RXQuality:FPControl:ENVironment:PCBits? Power Control Bits

Response	Description of parameters	Def. value	Def. unit	FW vers.
AUT	Auto mode, closed-loop operation	AUT	–	V3.20

Description of command	Sig. State
This command is always a query and returns the power control bit sequence that the CMU sends to the mobile station to control its output power.	All

Control of Measurement – Subsystem RXQuality:FPC

The subsystem *RXQuality:FPC* controls the Forward Power Control measurement of the receiver quality.The subsystem corresponds to the tab *Control* in the popup menu *Receiver Quality Configuration.*

INITiate:RXQuality:FPControl	Start new measurement	⇒ RUN
ABORt:RXQuality:FPControl	Abort running measurement and switch off	⇒ OFF
STOP:RXQuality:FPControl	Stop measurement	⇒ STOP
CONTinue:RXQuality:FPControl	Next measurement step (stepping mode)	⇒ RUN

Description of command	Sig. State	FW vers.
These commands do not exist as queries. They start or stop the current measurement, setting it to the status indicated.	All	V3.05

FETCh[:SCALar]:RXQuality:FPControl:STATus?				Measurement Status
Return	**Description of parameters**	**Def. value**	**Def. unit**	**FW vers.**
OFF | RUN | STOP | ERR | STEP | RDY,	Measurement in the OFF state (*RST or ABORt) Running (after INITiate, CONTinue or READ) Stopped (STOP) OFF (could not be started) Stepping mode (<stepmode>=STEP) Stopped according to repetition mode and stop condition	OFF	–	–
1 to 10000 | NONE,	Counter for current statistics cycle No counting mode set	NONE	–	–
1 to 10000 NONE	Counter for current evaluation period within a cycle Statistic count set to off	NONE	–	V3.05
Description of command				**Sig. State**
This command is always a query. It returns the status of the measurement.				All

Subsystem RXQuality:FPControl:CONTrol

The subsystem *RXQuality:FER:CONTrol:CONTrol* sets the control parameters for the receiver quality measurements. The subsystem corresponds to the tab *Control* in the popup menu *Receiver Quality Configuration.*

CONFigure:RXQuality:FPControl:EREPorting ***<Report Mode>***				Event Reporting
<Report Mode>	**Description of parameters**	**Def. value**	**Def. unit**	**FW vers.**
SRQ | SOPC | SRSQ | OFF | DEFault	Service request Single operation complete SRQ and SRSQ No reporting Sets the value to the default setting	OFF	–	V3.05
Description of command				**Sig. State**
This command defines the events generated when the measurement is terminated or stopped (see *Event Reporting* in Chapter 5 of the CMU manual).				All

CONFigure:RXQuality:FPControl:CONTrol[?] Scope of Measurement
<Statistics>, <Repetition>, <Stop Cond>, <Step Mode>

<Statistics>	Description of parameters	Def. value	Def. unit	
1 to 1000,	Number of bursts per statistics cycle	100	–	
<Repetition>	Description of parameters	Def. value	Def. unit	
1 to 10000	Multiple measurement (*counting*, until `Status = STEP | RDY`)	SING	–	
CONTinuous |	Continuous measurement (until `STOP` or `ABORT`)			
SINGleshot |	Single shot measurement (until `Status = RDY`)			
DEFault,				
<Stop Cond>	Description of parameters	Def. value	Def. unit	
NONE |	Continue measurement even in case of error	NONE	–	
ALEX |	Stop measurement in case of error (if any limit is exceeded)			
DEFault,				
<Step Mode>	Description of parameters	Def. value	Def. unit	FW-Vers.
STEP |	Interrupt measurement after each statistics cycle	NONE	–	V3.05
NONE |	Continue measurement according to its rep. mode			
DEFault				
Description of command				Sig. State
This command combines the `...CONTrol:STATistics` and the `...CONTrol:REPetition` commands, see below.				All

CONFigure:RXQuality:FPControl:CONTrol:STATistics[?] Statistic Count
<Statistics>

<Statistics>	Description of parameters	Def. value	Def. unit	FW-Vers.
1 to 1000 |	Number of bursts per statistics cycle	100	–	V3.05
NONE	Statistics off (equivalent to 1)			
Description of command				Sig. State
This command specifies the number of bursts forming a statistics cycle.				All

CONFigure:RXQuality:FPControl:CONTrol:REPetition[?] Test Cycles
<Repetition>

<Repetition>	Description of parameters	Def. value	Def. unit	
1 to 10000 CONTinuous | SINGleshot | DEFault	Multiple measurement (*counting*, until `Status = STEP | RDY`) Continuous measurement (until `STOP` or `ABORT`) Single shot measurement (until `Status = RDY`)	SING	–	
<Stop Cond>	Description of parameters	Def. value	Def. unit	
NONE | ALEX | DEFault,	Continue measurement even in case of error Stop measurement in case of error (if any limit is exceeded)	NONE	–	
<Step Mode>	Description of parameters	Def. value	Def. unit	FW-Vers.
STEP | NONE | DEFault	Interrupt measurement after each statistics cycle Continue measurement according to its rep. mode	NONE	–	V3.05
Description of command				Sig. State
This command determines the repetition mode for the measurement. ***Note:*** *In the case of READ commands (`READ:...`), the <Repetition> parameter has no effect; the measurement is always stopped after a single shot.*				All

CONFigure:RXQuality:FPControl:CONTrol:FPCMode[?] Mode
<Mode>

<Mode>	Description of parameters	Def. value	Def. unit	FW-Vers.
000 to 010	Forward power control mode (binary)	0	–	V3.05
Description of command				Sig. State
This command defines the forward power control operating mode. The different modes control the number of power control bits used to monitor the traffic channels. A total of 800 control bits are available. The mode can be set between 0 and 2 (binary format). 000 = All 800 bits are used to monitor the FCH channel 001 = 400 bits are used to monitor the FCH, 400 bits to monitor the SCH0 010 = 200 bits are used to monitor the FCH, 600 bits used to monitor the SCH0				All

CONFigure:RXQuality:FPControl:CONTrol:RDELay[?] Delay
<Delay>

<Delay>	Description of parameters	Def. value	Def. unit	FW-Vers.
4*n (0≤ n ≤ 31)	Number of frames to delay	0	–	V3.05
Description of command				Sig. State
This command sets the number of frames to delay before restarting the error statistics collection. Values that are not an integer multiple of 4 are rounded to the closest allowed value.				All

CONFigure:RXQuality:FPControl:CONTrol:RFRames[?] Frames
<Frames>

<Frames>	Description of parameters	Def. value	Def. unit	FW-Vers.
5 to 905	Number of frames for PMRM data	5	–	V3.05

Description of command	Sig. State
This command sets the number of frames for the mobile station to use to compile the PMRM (Power Measurement Report Message) data. Allowed values are: 5, 7, 10, 14, 20, 28, 40, 57, 80, 113, 160, 226, 320, 453, 640, 905. Any other value is rounded to the nearest allowed value !	All

CONFigure:RXQuality:FPControl:CONTrol:CPRimary[?] Primary Channel
<Primary>

<Primary>	Description of parameters	Def. value	Def. unit	FW-Vers.
FCH	Primary fundamental traffic channel	FCH	–	V3.05

Description of command	Sig. State
This command sets primary fundamental traffic channel to use. FCH is the only available selection.	All

CONFigure:RXQuality:FPControl:CONTrol:CSECondary[?] Secondary Channel
<Secondary>

<Secondary>	Description of parameters	Def. value	Def. unit	FW-Vers.
SCH0	Supplemental traffic channel	SCH0	–	V3.05

Description of command	Sig. State
This command sets the supplemental traffic channel. SCH0 is the only available selection.	All

CONFigure:RXQuality:FPControl:CONTrol:FCH:TFER[?] Target FER
<Target FER>

<Target FER>	Description of parameters	Def. value	Def. unit	FW-Vers.
0.2 to 30	Target frame error rate of fundamental traffic channel	0.5	%	V3.05

Description of command	Sig. State
This command sets a Frame Error Rate target (percentage of error) for the mobile station to achieve on the forward fundamental traffic channel. The mobile station continually adjusts its outerloop E_b/N_t setpoint to achieve and maintain the *Target FER* setting. The range of the outerloop setpoint is bound by the minimum and maximum setpoint settings. Allowed target FER values are: 0.2, 0.5, 1, 1.5, 2, 2.5, 3 , 3.5, 4 , 4.5, 5, 5.5, 6, ,6.5 , 7.5, 8, 8.5, 9, 9.5, 10, 11, 12, 13, 14, 15, 18, 21, 24, 27, 30. Any other value is rounded to the nearest allowed value !	All

CONFigure:RXQuality:FPControl:CONTrol:FCH:LSPoint:STTic:LOWer[?] E_b/N_t Setpoint
<Static Level>

<Static Level>	Description of parameters	Def. value	Def. unit	FW-Vers.
0.000 to 31.750	Lower static E_b/N_t outerloop setpoint level	0.000	dB	V3.05

Description of command	Sig. State
This command sets the minimum level that the mobile station is allowed to move the E_b/N_t setpoint to for forward power control of the forward fundamental traffic channel. If the static value is used, the setting can be adjusted between 0 to the current Maximum level. This setting is only valid if the lower dynamic E_b/N_t setpoint is off (`CONFigure:RXQuality:FPControl:CONTrol:FCH:LSPoint:DYNamic:LOWer[?]`). If the dynamic setpoint is on, a query returns HFF. **Note:** *Setting the Minimum and Maximum setpoints to the same values freezes the setpoint to that value, not allowing the mobile to adjust the level.*	All

CONFigure:RXQuality:FPControl:CONTrol:FCH:LSPoint:DYNamic:LOWer[?] E_b/N_t Setpoint
<Dynamic Level>

<Dynamic Level>	Description of parameters	Def. value	Def. unit	FW-Vers.
ON | OFF | DEFault	Enable the lower dynamic E_b/N_t outerloop setpoint	OFF	–	V3.05

Description of command	Sig. State
This command enables or disables the use of the dynamic (minimum) setpoint setting for forward power control of the forward fundamental traffic channel. When set to on, the minimum level is automatically set to the current mobile station's setpoint. When set to OFF, the static level setting is used. Refer to the command (`CONFigure:RXQuality:FPControl:CONTrol:FCH:LSPoint:STTic:LOWer[?]`). **Note:** *Setting both the Minimum and Maximum levels to Dynamic freezes the setpoint to the mobile station's current setpoint.*	All

CONFigure:RXQuality:FPControl:CONTrol:FCH:LSPoint:STTic:UPPer[?] E_b/N_t Setpoint
<Static Level>

<Static Level>	Description of parameters	Def. value	Def. unit	FW-Vers.
0.000 to 31.750	Upper static E_b/N_t outerloop setpoint level	31.750	dB	V3.05

Description of command	Sig. State
This command sets the maximum level that the mobile station is allowed to move the E_b/N_t setpoint to for forward power control of the forward fundamental traffic channel. If the static value is used, the setting can be adjusted between 31.750 to the current Minimum level. This setting is only valid if the upper dynamic E_b/N_t setpoint is off (`CONFigure:RXQuality:FPControl:CONTrol:FCH:LSPoint:DYNamic:UPPer[?]`). If the dynamic setpoint is on, a query returns HFF. **Note:** *Setting the Minimum and Maximum setpoints to the same values freezes the setpoint to that value, not allowing the mobile to adjust the level.*	All

CONFigure:RXQuality:FPControl:CONTrol:FCH:LSPoint:DYNamic:UPPer[?] E_b/N_t Setpoint
<Dynamic Level>

<Dynamic Level>	Description of parameters	Def. value	Def. unit	FW-Vers.
ON | OFF | DEFault	Enable the upper dynamic E_b/N_t outerloop setpoint	OFF	–	V3.05

Description of command	Sig. State
This command enables or disables the use of the dynamic (maximum) setpoint setting for forward power control of the forward fundamental traffic channel. When set to on, the maximum level is automatically set to the current mobile station's setpoint. When set to OFF, the static level setting is used. Refer to the command (`CONFigure:RXQuality:FPControl:CONTrol:FCH:LSPoint:STTic:UPPer[?]`). **Note:** *Setting both the Minimum and Maximum levels to Dynamic freezes the setpoint to the mobile station's current setpoint.*	All

CONFigure:RXQuality:FPControl:CONTrol:SCH:ZERO:TFER[?] Target FER
CONFigure:RXQuality:FPControl:CONTrol:SCH:ONE:TFER[?]
<Target FER> >

<Target FER>	Description of parameters	Def. value	Def. unit	FW-Vers.
0.2 to 30	Target frame error rate of supplemental traffic channel 0	0.5	%	V3.05

Description of command	Sig. State
These commands set a Frame Error Rate target (percentage of error) for the mobile station to achieve on the forward supplemental traffic channels 0 or 1. The mobile station continually adjusts its outerloop E_b/N_t setpoint to achieve and maintain the *Target FER* setting. The range of the outerloop setpoint is bound by the minimum and maximum setpoint settings. Allowed target FER values are: 0.2, 0.5, 1, 1.5, 2, 2.5, 3 , 3.5, 4 , 4.5, 5, 5.5, 6, ,6.5 , 7.5, 8, 8.5, 9, 9.5, 10, 11, 12, 13, 14, 15, 18, 21, 24, 27, 30. Any other value is rounded to the nearest allowed value !	All

CONFigure:RXQuality:FPControl:CONTrol:SCH:ZERO:LSPoint:STTic:LOWer[?] E_b/N_t Setpoint
CONFigure:RXQuality:FPControl:CONTrol:SCH:ONE:LSPoint:STTic:LOWer[?]
<Static Level>

<Static Level>	Description of parameters	Def. value	Def. unit	FW-Vers.
0.000 to 31.750	Lower static E_b/N_t outerloop setpoint level	0.000	dB	V3.05

Description of command	Sig. State
These commands set the minimum level that the mobile station is allowed to move the E_b/N_t setpoint to for forward power control of the forward supplemental traffic channels 0 or 1. If the static value is used, the setting can be adjusted between 0 to the current Maximum level. This setting is only valid if the lower dynamic E_b/N_t setpoint is off (`CONFigure:RXQuality:FPControl:CONTrol:SCH:LSPoint:DYNamic:LOWer[?]`). If the dynamic setpoint is on, a query returns HFF. **Note:** *Setting the Minimum and Maximum setpoints to the same values freezes the setpoint to that value, not allowing the mobile to adjust the level.*	All

CONFigure:RXQuality:FPControl:CONTrol:SCH:ZERO:LSPoint:DYNamic:LOWer[?] E_b/N_t Setpoint
CONFigure:RXQuality:FPControl:CONTrol:SCH:ONE:LSPoint:DYNamic:LOWer[?]
<Dynamic Level>

<Dynamic Level>	Description of parameters	Def. value	Def. unit	FW-Vers.
ON | OFF | DEFault	Enable the lower dynamic E_b/N_t outerloop setpoint	OFF	–	V3.05

Description of command	Sig. State
These commands enable or disable the use of the dynamic (minimum) setpoint setting for forward power control of the forward supplemental traffic channels 0 or 1. When set to on, the minimum level is automatically set to the current mobile station's setpoint. When set to OFF, the static level setting is used. Refer to the command (`CONFigure:RXQuality:FPControl:CONTrol:SCH:LSPoint:STTic:LOWer[?]`). **Note:** *Setting both the Minimum and Maximum levels to Dynamic freezes the setpoint to the mobile station's current setpoint.*	All

CONFigure:RXQuality:FPControl:CONTrol:SCH:ZERO:LSPoint:STTic:UPPer[?] E_b/N_t Setpoint
CONFigure:RXQuality:FPControl:CONTrol:SCH:ONE:LSPoint:STTic:UPPer[?]
<Static Level>

<Static Level>	Description of parameters	Def. value	Def. unit	FW-Vers.
0.000 to 31.750	Upper static E_b/N_t outerloop setpoint level	31.750	dB	V3.05

Description of command	Sig. State
These commands set the maximum level that the mobile station is allowed to move the E_b/N_t setpoint to for forward power control of the supplemental traffic channels 0 or 1. If the static value is used, the setting can be adjusted between 31.750 to the current minimum level. This setting is only valid if the upper dynamic E_b/N_t setpoint is off (`CONFigure:RXQuality:FPControl:CONTrol:SCH:LSPoint:DYNamic:UPPer[?]`). If the dynamic setpoint is on, a query returns HFF. **Note:** *Setting the Minimum and Maximum setpoints to the same values freezes the setpoint to that value, not allowing the mobile to adjust the level.*	All

CONFigure:RXQuality:FPControl:CONTrol:SCH:ZERO:LSPoint:DYNamic:UPPer[?] E_b/N_t Setpoint
CONFigure:RXQuality:FPControl:CONTrol:SCH:ONE:LSPoint:DYNamic:UPPer[?]
<Dynamic Level>

<Dynamic Level>	Description of parameters	Def. value	Def. unit	FW-Vers.
ON | OFF | DEFault	Enable the upper dynamic E_b/N_t outerloop setpoint	OFF	–	V3.05

Description of command	Sig. State
These commands enable or disable the use of the dynamic (maximum) setpoint setting for forward power control of the forward supplemental traffic channels 0 or 1. When set to on, the maximum level is automatically set to the current mobile station's setpoint. When set to OFF, the static level setting is used. Refer to the command (`CONFigure:RXQuality:FPControl:CONTrol:SCH:LSPoint:STTic:UPPer[?]`). **Note:** *Setting both the Minimum and Maximum levels to Dynamic freezes the setpoint to the mobile station's current setpoint.*	All

Measured Values – Subsystem RXQuality:FPControl

The subsystem *RXQuality:FPControl* measures and outputs the bit error rate and compares it with the tolerance values. The subsystem corresponds to the output fields in the *Forward Power Control Receiver Quality* menu.

	Scalar Results:
READ[:SCALar]:RXQuality:FPControl?	Start single shot measurement and return results
FETCh[:SCALar]:RXQuality:FPControl?	Read out meas. results (unsynchronized)
SAMPle[:SCALar]:RXQuality:FPControl?	Read out measurement results (synchronized)

Returned values	Value range	Def. value	Def. unit	FW vers.
Actual Output Power,	–120.0 dBm to –33.0 dBm,	NAN	dBm	V3.05
FER (FCH),	0.0% to 100.0%,	NAN	%	
Frame Errors (FCH),	0 to 20000,	NAN	–	
Transmitted Frames (FCH),	0 to 20000,	NAN	–	
Confidence Level (FCH),	0.000% to 100.000%,	NAN	%	
Adjusted Level (FCH),	,	NAN		
Fwd Channel Level (FCH),	,	NAN		
Current Setpoint (FCH),	0.000 to 31.750,	NAN	–	
BS Calculated E_bN_t (FCH),	,	NAN		
FER (DCCH),	Not values returned for the Dedicated Control Channel.	NAN	%	
Frame Errors (DCCH),		NAN	–	
Transmitted Frames (DCCH),		NAN	–	
Confidence Level (DCCH),		NAN	%	
Adjusted Level (DCCH),		NAN		
Fwd Channel Level (DCCH),		NAN		
Current Setpoint (DCCH),		NAN	–	
BS Calculated E_bN_t (DCCH),		NAN		
FER (SCH0),	0.0% to 100.0%	NAN	%	
Frame Errors (SCH0),	0 to 20000	NAN	–	
Transmitted Frames (SCH0),	0 to 20000	NAN	–	
Confidence Level (SCH0),	0.000% to 100.000%	NAN	%	
Adjusted Level (SCH0),		NAN		
Fwd Channel Level (SCH0),		NAN		
Current Setpoint (SCH0),	0.000 to 31.750	NAN	–	
BS Calculated E_bN_t (SCH0),		NAN		
FER (SCH1),	No values returned for the Supplemental Channel 1.	NAN	%	
Frame Errors(SCH1),		NAN	–	
Transmitted Frames (SCH1),		NAN	–	
Confidence Level (SCH1),		NAN	%	
Adjusted Level (SCH1),		NAN		
Fwd Channel Level (SCH1),		NAN		
Current Setpoint (SCH1),		NAN	–	
BS Calculated E_bN_t (SCH1)		NAN		

Description of command	Sig. State
These commands are always queries. They start the Forward Power Control measurement and output the measurement results (refer to Chapter 4 about measured values). Values are returned for the Total Output Power, Fundamental Channel, and Supplemental Channel 0. The Dedicated Control Channel and Supplemental Channel 1 are not measured.	All

List of Non-Signalling Commands

In the following, all remote-control commands of the CDMA2000 Non-Signalling function group are listed. They are arranged alphabetically by the second keyword of the command so that related commands are listed together.

Table 6-1 Remote-control commands (Non-Signalling)

Inputs and Outputs

[SENSe:]LEVel:MODE[?]	6.3
[SENSe:]LEVel:MAXimum[?]	6.3
INPut[:STATe]	6.12
OUTPut[:STATe]	6.12
[SENSe:]CORRection:LOSS:INPut<nr>[:MAGNitude]	6.12
SOURce:CORRection:LOSS:INPut<nr>[:MAGNitude]	6.12
[SENSe:]CORRection:LOSS:OUTPut<nr>[:MAGNitude]	6.12
SOURce:CORRection:LOSS:OUTPut<nr>[:MAGNitude]	6.12
SOURce:DM:CLOCk:STATe	6.13
SOURce:DM:CLOCk:FREQuency	6.13

Impairments

SOURce:IMPairments:LEVel:AWGN[?]	6.11
SOURce:IMPairments:FOFFset[:RF][?]	6.11

I/Q-IF Interface

CONFigure:IQIF:RXTXcombined	6.26
CONFigure:IQIF:RXPath	6.26
CONFigure:IQIF:TXPath	6.27
IQIF:DEFault	6.27

Modulation

INITiate:MODulation:MQUality[:OQPSk]	6.14
INITiate:MODulation:MQUality:HPSK	6.14
INITiate:MODulation:MQUality:QPSK	6.14
ABORt:MODulation:MQUality[:OQPSk]	6.14
ABORt:MODulation:MQUality:HPSK	6.14
ABORt:MODulation:MQUality:QPSK	6.14
STOP:MODulation:MQUality[:OQPSk]	6.14
STOP:MODulation:MQUality:HPSK	6.14
STOP:MODulation:MQUality:QPSK	6.14
CONTinue:MODulation:MQUality[:OQPSk]	6.14
CONTinue:MODulation:MQUality:HPSK	6.14
CONTinue:MODulation:MQUality:QPSK	6.14
CONFigure:MODulation:MQUality[:OQPSk]:EREPorting[?]	6.14
CONFigure:MODulation:MQUality:HPSK:EREPorting[?]	6.14
CONFigure:MODulation:MQUality:QPSK:EREPorting[?]	6.14
FETCh[:SCALar]:MODulation:MQUality[:OQPSk]:STATus?	6.15
FETCh[:SCALar]:MODulation:MQUality:HPSK:STATus?	6.15
FETCh[:SCALar]:MODulation:MQUality:QPSK:STATus?	6.15
XTND:MODulation:MQUality[:OQPSk]:SBSuppress[?]	6.15
XTND:MODulation:MQUality:HPSK:SBSuppress[?]	6.15
XTND:MODulation:MQUality:QPSK:SBSuppress[?]	6.15

DEFault:MODulation:MQUality:CONTrol[?] 6.16
DEFault:MODulation:MQUality[:OQPSk]:CONTrol[?] 6.16
DEFault:MODulation:MQUality:HPSK:CONTrol[?] 6.16
DEFault:MODulation:MQUality:QPSK:CONTrol[?] 6.16
CONFigure:MODulation:MQUality[:OQPSk]:CONTrol[?] 6.17
CONFigure:MODulation:MQUality:HPSK:CONTrol[?] 6.17
CONFigure:MODulation:MQUality:QPSK:CONTrol[?] 6.17
CONFigure:MODulation:MQUality[:OQPSk]:CONTrol:STATistics[?] 6.17
CONFigure:MODulation:MQUality:HPSK:CONTrol:STATistics[?] 6.17
CONFigure:MODulation:MQUality:QPSK:CONTrol:STATistics[?] 6.17
CONFigure:MODulation:MQUality[:OQPSk]:CONTrol:REPetition[?] 6.18
CONFigure:MODulation:MQUality:HPSK:CONTrol:REPetition[?] 6.18
CONFigure:MODulation:MQUality:QPSK:CONTrol:REPetition[?] 6.18
CONFigure:MODulation:MQUality[:OQPSk]:CONTrol:FOFFset:SBSuppress:ACP<nr>[?] 6.18
CONFigure:MODulation:MQUality:HPSK:CONTrol:FOFFset:SBSuppress:ACP<nr>[?] 6.18
CONFigure:MODulation:MQUality:QPSK:CONTrol:FOFFset:SBSuppress:ACP<nr>[?] 6.18
CONFigure:MODulation:MQUality[:OQPSk]:CMMax:LIMit[?] 6.19
CONFigure:MODulation:MQUality:HPSK:CMMax:LIMit[?] 6.19
CONFigure:MODulation:MQUality:QPSK:CMMax:LIMit[?] 6.19
CONFigure:MODulation:MQUality[:OQPSk]:AVERage:LIMit[?] 6.20
CONFigure:MODulation:MQUality:HPSK:AVERage:LIMit[?] 6.20
CONFigure:MODulation:MQUality:QPSK:AVERage:LIMit[?] 6.20
DEFault:MODulation:MQUality[:OQPSk]:CMMax:LIMit[?] 6.21
DEFault:MODulation:MQUality:HPSK:CMMax:LIMit[?] 6.21
DEFault:MODulation:MQUality:QPSK:CMMax:LIMit[?] 6.21
DEFault:MODulation:MQUality[:OQPSk]:AVERage:LIMit[?] 6.21
DEFault:MODulation:MQUality:HPSK:AVERage:LIMit[?] 6.21
DEFault:MODulation:MQUality:QPSK:AVERage:LIMit[?] 6.21
DEFault:MODulation:MQUality:LIMit[?] 6.21
READ[:SCALar]:MODulation:MQUality[:OQPSk]? 6.22
READ[:SCALar]:MODulation:MQUality:HPSK? 6.22
READ[:SCALar]:MODulation:MQUality:QPSK? 6.22
FETCh[:SCALar]:MODulation:MQUality[:OQPSk]? 6.22
FETCh[:SCALar]:MODulation:MQUality:HPSK? 6.22
FETCh[:SCALar]:MODulation:MQUality:QPSK? 6.22
SAMPle[:SCALar]:MODulation:MQUality[:OQPSk]? 6.22
SAMPle[:SCALar]:MODulation:MQUality:HPSK? 6.22
SAMPle[:SCALar]:MODulation:MQUality:QPSK? 6.22
CALCulate[:SCALar]:MODulation:MQUality[:OQPSk]:MATChing:LIMIt? 6.23
CALCulate[:SCALar]:MODulation:MQUality:HPSK:MATChing:LIMIt? 6.23
CALCulate[:SCALar]:MODulation:MQUality:QPSK:MATChing:LIMIt? 6.23

Narrow Band Power

INITiate:NPOWer 6.30
ABORt:NPOWer 6.30
STOP:NPOWer 6.30
CONTinue:NPOWer 6.30
CONFigure:NPOWer:EREPorting[?] 6.30
FETCh[:SCALar]:NPOWer:STATus? 6.30
CONFigure:NPOWer:CONTrol:CBSize[?] 6.31
CONFigure:NPOWer:CONTrol[?] 6.31
CONFigure:NPOWer:CONTrol:STATistics[?] 6.31
CONFigure:NPOWer:CONTrol:REPetition[?] 6.32
READ[:SCALar]:NPOWer? 6.32

FETCh[:SCALar]:NPOWer? 6.32
SAMPle[:SCALar]:NPOWer? 6.32

Options

SYSTem:OPTions:INFO:CURRent? 6.24

Partial Reset

SYSTem:RESet:CURRent 6.25

RF Analyzer

DEFault:RFANalyzer[?] 6.2
[SENSe:]RFANalyzer:FREQuency:UNIT[?] 6.2
[SENSe:]RFANalyzer:FREQuency[?] 6.3
[SENSe:]RFANalyzer:FOFFset[?] 6.3

RF Generator

DEFault:RFGenerator[?] 6.6
INITiate:RFGenerator 6.6
ABORt:RFGenerator 6.6
FETCh:RFGenerator:STATus? 6.6
SOURce:RFGenerator:LEVel:OCNS:VALue? 6.6
SOURce:RFGenerator:LEVel:OCNS:ENABle[?] 6.7
SOURce:RFGenerator:FREQuency[:RF]:UNIT[?] 6.7
SOURce:RFGenerator:FREQuency[:RF][?] 6.7
SOURce:RFGenerator:CHANnel:FFCH[?] 6.7
SOURce:RFGenerator:PROPerty:PNOFfset[?] 6.8
SOURce:RFGenerator:FROFfset:FFCH[?] 6.8
SOURce:RFGenerator:FRATe:FFCH[?] 6.8
SOURce:RFGenerator:MODulation:MODe[?] 6.8
SOURce:RFGenerator:POWer:CDMA[?] 6.8
SOURce:RFGenerator:POWer:OUTput? 6.9
SOURce:RFGenerator:LEVel:FFCH[?] 6.9
SOURce:RFGenerator:LEVel:FSYNc[?] 6.9
SOURce:RFGenerator:LEVel:FPICh[?] 6.9
SOURce:RFGenerator:LEVel:FPCH[?] 6.10
CONFigure:RFGenerator:PCBits[?] 6.10
SOURce:RFGenerator: PATTern:SQMode[?] 6.10
SOURce:RFGenerator: PATTern: AREA<no>:NOBits[?] 6.10
SOURce:RFGenerator: PATTern: AREA1:LHBit[?] 6.11
SOURce:RFGenerator: PATTern: AREA<no>:POLarity[?] 6.11

Save/Recall

MMEMory:SAVE:CURRent 6.25
MMEMory:RECall:CURRent 6.25

Symbolic Status Event Register Evaluation

STATus:OPERation:SYMBolic:ENABle 6.27
STATus:OPERation:SYMBolic[:EVENt]? 6.28

Version

SYSTem:VERSion:SW:MMI? 6.24

Wide Band Power

INITiate:WPOWer 6.28
ABORt:WPOWer 6.28
STOP:WPOWer 6.28
CONTinue:WPOWer 6.28
CONFigure:WPOWer:EREPorting 6.28
FETCh:WPOWer:STATus? 6.28
CONFigure:WPOWer:CONTrol:REPetition 6.29
READ[:SCALar]:WPOWer? 6.29
FETCh[:SCALar]:WPOWer? 6.29
SAMPle[:SCALar]:WPOWer? 6.29

Trigger

DEFault:TRIGger[:SEQuence][?] 6.4
DEFault:TRIGger[:SEQuence]:SOURce[?] 6.4
TRIGger[:SEQuence]:SOURce[:OQPSk][?] 6.4
TRIGger[:SEQuence]:SOURce:HPSK[?] 6.4
TRIGger[:SEQuence]:SOURce:QPSK[?] 6.4
TRIGger[:SEQuence]:THReshold:RFPower 6.5
TRIGger[:SEQuence]:THReshold:IFPower 6.5
TRIGger[:SEQuence]:SLOPe 6.5
TRIGger:OUTPut:PIN<nr>:SIGNal[?] 6.5

List of Signalling Commands

In the following, all remote-control commands of the CDMA2000 Signalling function group are listed. They are arranged alphabetically by the second keyword of the command so that related commands are listed together.

Table 6-2 Remote-control commands (Signalling)

Base Station Signal

DEFault:BSSignal[?] 6.73
UNIT:BSSignal:CHANnel[:RF][?] 6.73
CONFigure:BSSignal:CHANnel[:RF][?] 6.74
PROCedure:BSSignal:CHANnel[:RF][?] 6.74
CONFigure:BSSignal:POWer:CDMA[?] 6.74
PROCedure:BSSignal:POWer:CDMA[?] 6.74
CONFigure:BSSignal:POWer:OUTPut? 6.75
CONFigure:BSSignal:LEVel:FSYNc[?] 6.75
CONFigure:BSSignal:LEVel:FPICh[?] 6.75
CONFigure:BSSignal:LEVel:OCNS:ENABle[?] 6.75
CONFigure:BSSignal:LEVel:OCNS:VALue? 6.76
CONFigure:BSSignal:PCBits[?] 6.76
CONFigure:BSSignal:PATTern:SQMode[?] 6.76
CONFigure:BSSignal:PATTern:SSIZe[?] 6.76
CONFigure:BSSignal: PATTern:AREA<no>:NOBits[?] 6.77
CONFigure:BSSignal:PATTern:AREA1:LHBit[?] 6.77

CONFigure:BSSignal:PATTern:AREA<no>:POLarity[?] 6.77
CONFigure:BSSignal:CHANnel:FFCH[?] 6.77
PROCedure:BSSignal:CHANnel:FFCH[?] 6.77
CONFigure:BSSignal:LEVel:FFCH[?] 6.78
PROCedure:BSSignal:LEVel:FFCH[?] 6.78
CONFigure:BSSignal:FROFfset:FFCH[?] 6.78
PROCedure:BSSignal:FROFfset:FFCH[?] 6.78
CONFigure:BSSignal:QOF:FFCH[?] 6.78
PROCedure:BSSignal:QOF:FFCH[?] 6.78
CALCulate[:SCALar]:BSSignal:EBNT:FFCH? 6.78
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ABORt:POWer:MAOutput:HPSK 6.131
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Power (Minimum Output)

INITiate:POWer:MIOutput[:OQPSk] ... 6.122
ABORt:POWer:MIOutput[:OQPSk] ... 6.122
STOP:POWer:MIOutput[:OQPSk] ... 6.122
CONTinue:POWer:MIOutput[:OQPSk] ... 6.122
INITiate:POWer:MIOutput:HPSK ... 6.122

ABORt:POWer:MIOutput:HPSK ... 6.122
STOP:POWer:MIOutput:HPSK ... 6.122
CONTinue:POWer:MIOutput:HPSK ... 6.122
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CONFigure:SCONfig:SCLass1:TDAT:S32D:SCH:ONE:REVerse:FRTYpe[?] 6.64
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CONFigure:SCONfig:SCLass1:PDAT:S33D:SCH:ONE:REVerse:CODing ... 6.70
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[SENSe:]SIGNalling:STATe? ... 6.35

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SPECtrum:ACP Measurement
INITiate:SPECtrum:ACP ... 6.196
ABORt:SPECtrum:ACP ... 6.196
STOP:SPECtrum:ACP ... 6.196
CONTinue:SPECtrum:ACP ... 6.196
CONFigure:SPECtrum:ACP:EREPorting[?] ... 6.196
FETCh[:SCALar]:SPECtrum:ACP:STATus? ... 6.196
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INITiate:SAPPower ... 6.95
ABORt:SAPPower ... 6.95
STOP:SAPPower ... 6.95

CONTinue:SAPPower ... 6.95
CONFigure:SAPPower:EREPorting[?] ... 6.95
FETCh[:SCALar]:SAPPower:STATus? ... 6.95
READ[:SCALar]:SAPPower? ... 6.96
FETCh[:SCALar]:SAPPower? ... 6.96
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Symbolic Status Event Register Evaluation

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TRIGger[:SEQuence]:THReshold:RFPower ... 6.99
TRIGger[:SEQuence]:THReshold:IFPower ... 6.99
TRIGger[:SEQuence]:SLOPe ... 6.100
TRIGger:OUTPut:PIN<nr>:SIGNal[?] ... 6.100

Version

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Wide Band Power

INITiate:WPOWer ... 6.28
ABORt:WPOWer ... 6.28
STOP:WPOWer ... 6.28
CONTinue:WPOWer ... 6.28
CONFigure:WPOWer:EREPorting ... 6.28
FETCh:WPOWer:STATus? ... 6.28
CONFigure:WPOWer:CONTrol:REPetition ... 6.29
READ[:SCALar]:WPOWer? ... 6.29
FETCh[:SCALar]:WPOWer? ... 6.29
SAMPle[:SCALar]:WPOWer? ... 6.29

7 Remote Control – Program Example

The following example program illustrates primary and secondary addressing by setting up a call and performing simple measurements with the CMU. In the example, remote control via GPIB bus and the programming language *Winbatch* is used.

Winbatch uses device names such as *CMUBASE, C2KCell-S, AMPS-MS* which are previously defined and assigned to the primary address, secondary address, and some general device settings.

With these device names, a complete command line reads:

```
CMUBASE: <CMU_Command>
```

where `<CMU_Command>` may be any of the commands (setting commands or queries) specified within the function group and mode identified by the device name `CMUBASE`. Program sequences consisting of commands that are defined in several function groups and modes can be re-used with an exchanged device name.

In addition to these data transfer commands, *Winbatch* provides *WHILE, GOTO*, and *IF* statements to express conditions and define loops.

With the statement:

```
WHILE C2KCell-S: sign:stat? <> REG
```

the instrument waits until it has reached the signalling state *Registered* before it executes the following commands.

For a C program assigning secondary addresses, refer to Chapter 7 of the CMU operating manual.

Preliminary configurations for different measurements are defined, and the network parameters are set. A CDMA2000 connection with F-RC 5, R-RC 4 is established, several measurements are executed followed by an handoff to AMPS.

Before running the program, configure your *Winbatch* settings such that *CMUBASE* is the device name for the CMU *BASE* system and *C2KCell-S, AMPS-MS* denote the function groups *CDMA2000 Cellular, AMPS Signalling* function groups.

```
ECHO ON

FPRINT ----------------------------------------------------------------------
FPRINT INITIALISATION ROUTINE:
FPRINT ASK FOR THE IDENTIFIER OF THE CMU, RESET THE INSTRUMENT,
FPRINT DEFINE THE SECONDARY ADDRESSES FOR ALL AVAILABLE FUNCTION GROUPS
FPRINT ----------------------------------------------------------------------

CMUBASE: *IDN?
CMUBASE: *RST;*OPC?
CMUBASE: *CLS

CMUBASE: SYST:ERR?
```

```
; Get primary and secondary addresses
CMUBASE: SYSTEM:REMOTE:ADDR:PRIM?
CMUBASE: SYST:REM:ADDR:SEC?

; Set the secondary address of the functional groups
CMUBASE: SYST:REM:ADDR:SEC?

CMUBASE: SYST:REM:ADDR:SEC 1,"CDMA2K450MS_Sig"
CMUBASE: SYST:REM:ADDR:SEC 2,"CDMA2K450MS_NSig"
CMUBASE: SYST:REM:ADDR:SEC 3,"CDMA2KCellMS_Sig"
CMUBASE: SYST:REM:ADDR:SEC 4,"CDMA2KCellMS_NSig"
CMUBASE: SYST:REM:ADDR:SEC 5,"CDMA2KPCSMS_Sig"
CMUBASE: SYST:REM:ADDR:SEC 6,"CDMA2KPCSMS_NSig"
CMUBASE: SYST:REM:ADDR:SEC 7,"CDMA2KIMT2KMS_Sig"
CMUBASE: SYST:REM:ADDR:SEC 8,"CDMA2KIMT2KMS_NSig"
CMUBASE: SYST:REM:ADDR:SEC 9,"AMPSMS_Sig"
CMUBASE: SYST:REM:ADDR:SEC 10,"AMPSMS_NSig"
CMUBASE: SYST:REM:ADDR:SEC 11,"RF_NSig"

CMUBASE: SYST:REM:ADDR:SEC?

FPRINT --------------------------------------------------------------------
FPRINT Configure the connector
FPRINT --------------------------------------------------------------------
C2KCell-S: INP:STAT RF2
C2KCell-S: OUTP:STAT RF2
C2KCell-S: SENS:CORR:LOSS:INP2 1.0
C2KCell-S: SENS:CORR:LOSS:OUTP2 1.0

FPRINT --------------------------------------------------------------------
FPRINT Network configuration
FPRINT --------------------------------------------------------------------

C2KCell-S: CONFigure:NETWork:STANDard USC
C2KCell-S: CONFigure:NETWork:STANDard?

C2KCell-S: CONFigure:NETWork:IDENtity:MCC?
C2KCell-S: CONFigure:NETWork:SYSTem:SID 1
C2KCell-S: CONFigure:NETWork:SYSTem:SID?
C2KCell-S: CONFigure:NETWork:IDENtity:NID?

FPRINT --------------------------------------------------------------------
FPRINT SUBSYSTEM BSSignal
FPRINT --------------------------------------------------------------------

C2KCell-S: CONFigure:BSSignal:CHANnel 283
C2KCell-S: CONFigure:BSSignal:CHANnel?
C2KCell-S: CONFigure:BSSignal:POWer:CDMA -50
C2KCell-S: CONFigure:BSSignal:POWer:CDMA?
C2KCell-S: CONFigure:BSSignal:POWer:OUTput?

FPRINT --------------------------------------------------------------------
FPRINT SUBSYSTEM Service Configuration
FPRINT --------------------------------------------------------------------

C2KCell-S: CONFigure:SCONfig:SCLass1:SERVice Loop
C2KCell-S: CONFigure:SCONfig:SCLass1:SERVice?
```

```
C2KCell-S: CONFigure:SCONfig:SCLass1:LOOP:S02D:FCH:RC 1,1
C2KCell-S: CONFigure:SCONfig:SCLass1:LOOP:S02D:FCH:RC?
C2KCell-S: CONFigure:SCONfig:SCLass1:LOOP:S09D:FCH:RC 5,4
C2KCell-S: CONFigure:SCONfig:SCLass1:LOOP:S09D:FCH:RC?

C2KCell-S: CONFigure:SCONfig:SCLass1:LOOP:S02D:FCH?
C2KCell-S: CONFigure:SCONfig:SCLass1:LOOP:S09D:FCH?

C2KCell-S: CONFigure:SCONfig:SCLass1:LOOP:SOPTion S02D
C2KCell-S: CONFigure:SCONfig:SCLass1:LOOP:SOPTion?

FPRINT ---------------------------------------------------------------------
FPRINT Configure Overview measurements
FPRINT ---------------------------------------------------------------------

C2KCell-S: CONFigure:OVERview:OVERview:HPSK:CONTrol:STATistics 50
C2KCell-S: CONFigure:OVERview:OVERview:HPSK:CONTrol:STATistics?

C2KCell-S: CONFigure:OVERview:CQUality:CONTrol:FRAMes 30
C2KCell-S: CONFigure:OVERview:CQUality:CONTrol:FRAMes?

C2KCell-S: CONFigure:OVERview:PPOWer:ENABle ON
C2KCell-S: CONFigure:OVERview:PPOWer:ENABle?


FPRINT ---------------------------------------------------------------------
FPRINT Configure FER measurement
FPRINT ---------------------------------------------------------------------

C2KCell-S: CONFigure:RXQuality:FER:FSSCommon:CONTrol:TSETup1:POWer:CDMA -104
C2KCell-S: CONFigure:RXQuality:FER:FSSCommon:CONTrol:TSETup1:POWer:CDMA?
C2KCell-S: CONFigure:RXQuality:FER:FSSCommon:CONTrol:TSETup1:LEVel -7, -
15.6, -13.5
C2KCell-S: CONFigure:RXQuality:FER:FSSCommon:CONTrol:TSETup1:LEVel?

C2KCell-S: CONFigure:RXQuality:FER:FCH:CONTrol:TSETup1:FRAMes 10
C2KCell-S: CONFigure:RXQuality:FER:FCH:CONTrol:TSETup1:FRAMes?
C2KCell-S: CONFigure:RXQuality:FER:FCH:CONTrol:TSETup1:REPetition
SING,NONE,NONE
C2KCell-S: CONFigure:RXQuality:FER:FCH:CONTrol:TSETup1:REPetition?

C2KCell-S: CONFigure:RXQuality:FER:FSSCommon:CONTrol:TSETup2:POWer:CDMA -25
C2KCell-S: CONFigure:RXQuality:FER:FSSCommon:CONTrol:TSETup2:POWer:CDMA?
C2KCell-S: CONFigure:RXQuality:FER:FSSCommon:CONTrol:TSETup2:LEVel -7, -
15.6, -13.5
C2KCell-S: CONFigure:RXQuality:FER:FSSCommon:CONTrol:TSETup2:LEVel?

C2KCell-S: CONFigure:RXQuality:FER:FCH:CONTrol:TSETup2:FRAMes 10
C2KCell-S: CONFigure:RXQuality:FER:FCH:CONTrol:TSETup2:FRAMes?
C2KCell-S: CONFigure:RXQuality:FER:FCH:CONTrol:TSETup2:REPetition
SING,NONE,NONE
C2KCell-S: CONFigure:RXQuality:FER:FCH:CONTrol:TSETup2:REPetition?

FPRINT ---------------------------------------------------------------------
FPRINT Configure NPM measurement
FPRINT ---------------------------------------------------------------------
```

```
C2KCell-S: CONFigure:NPOWer:CONTrol:REPetition SING,NONE,NONE
C2KCell-S: CONFigure:NPOWer:CONTrol:REPetition?
C2KCell-S: CONFigure:NPOWer:EREPorting?
C2KCell-S: CONFigure:NPOWer:CONTrol:STATistics 1
C2KCell-S: CONFigure:NPOWer:CONTrol:STATistics?

FPRINT --------------------------------------------------------------------
FPRINT Configure the CMU - Function Group AMPS
FPRINT --------------------------------------------------------------------

AMPS-MS: CONFigure:NETWork:MS:CMAC 7
AMPS-MS: CONFigure:NETWork:MS:VMAC 7
AMPS-MS: CONFIGURE:BSSIGNAL:AVC:CHANNEL 312
AMPS-MS: CONFigure:NETWork:OCHandoff:MS:VMAC 7

FPRINT --------------------------------------------------------------------
FPRINT Switch on the RF Signal and wait for registration
FPRINT --------------------------------------------------------------------

C2KCell-S: PROC:SIGN:ACT SON
C2KCell-S: SIGNalling:STATe?

REPORT OFF
WHILE C2KCell-S: sign:stat? <> REG
REPORT ON

C2KCell-S: SIGNalling:STATe?

FPRINT --------------------------------------------------------------------
FPRINT Establish SO9 Call: F-RC = 5 and R-RC = 4
FPRINT --------------------------------------------------------------------

C2KCell-S: CONFigure:SCONfig:SCLass1:LOOP:SOPTion S09D
C2KCell-S: CONFigure:SCONfig:SCLass1:LOOP:SOPTion?

C2KCell-S: PROCedure:SIGNalling:ACTion CTM

REPORT OFF
WHILE C2KCell-S: sign:stat? <> CEST
REPORT ON

C2KCell-S: SIGNalling:STATe?

FPRINT --------------------------------------------------------------------
FPRINT Overview Pilot Power, Modulation and Channel Quality in parallel
FPRINT --------------------------------------------------------------------

C2KCell-S: INIT:OVERview:CQUality
C2KCell-S: READ:OVERview:OVERview:HPSK?
C2KCell-S: OVERview:PPOWer?

WHILE C2KCell-S: FETC:OVERview:CQUality:STAT? !{} RDY

; Collect CQuality results
C2KCell-S: FETC:OVERview:CQUality?
C2KCell-S: ABORT:OVERview:CQUality
```

```
FPRINT -----------------------------------------------------------------
FPRINT FER measurement
FPRINT -----------------------------------------------------------------

C2KCell-S: CONFigure:RXQuality:FER:FSSCommon:TSETup T1
C2KCell-S: CONFigure:RXQuality:FER:FSSCommon:TSETup?
C2KCell-S: READ:SCALar:RXQuality:FER:FCH?

C2KCell-S: CONFigure:RXQuality:FER:FSSCommon:TSETup T2
C2KCell-S: CONFigure:RXQuality:FER:FSSCommon:TSETup?
C2KCell-S: READ:SCALar:RXQuality:FER:FCH?

FPRINT -----------------------------------------------------------------
FPRINT NPM measurement
FPRINT -----------------------------------------------------------------

[NPOWLOOP]
C2KCell-S: READ:NPOWer?
REPEAT 15 NPOWLOOP

FPRINT -----------------------------------------------------------------
FPRINT CDP measurement
FPRINT -----------------------------------------------------------------

C2KCell-S: READ:SCALar:CDPower:CDPW?
C2KCell-S: READ:SCALar:CDPower:PCDep?
C2KCell-S: READ:SCALar:CDPower:CHPW?

FPRINT -----------------------------------------------------------------
FPRINT Start the AMPS Handoff
FPRINT -----------------------------------------------------------------

C2KCell-S: STATus:HANDoff:TARGet:LIST?
C2KCell-S: CONFigure:HANDoff:TARGet 'AMPSMS'
C2KCell-S: CONFigure:HANDoff:TARGet?

C2KCell-S: PROCedure:SIGNalling:ACTion HAND

FPRINT -----------------------------------------------------------------
FPRINT Query the CMU State
FPRINT -----------------------------------------------------------------

REPORT OFF
WHILE AMPS-MS: sign:stat? <> CEST
REPORT ON

FPRINT -----------------------------------------------------------------
FPRINT AMPS Handoff was successful
FPRINT Query the power class of the mobile
FPRINT -----------------------------------------------------------------
AMPS-MS: MSSinfo:PCLass?
```

```
FPRINT ------------------------------------------------------------------
FPRINT Start TX Tests Modulation measurement
FPRINT Result: CarrierFreqError, TotalPeakDeviation, SATFreqError,
SATPeakDeviation, STFreqError, STPeakDeviation,
FPRINT         AudioPeakDeviation, AudioRMSDeviation, ModDistNoise,
CarrierPower, ResidualAM
FPRINT ------------------------------------------------------------------

AMPS-MS: READ:TXT:MOD?


FPRINT ------------------------------------------------------------------
FPRINT Call Release
FPRINT ------------------------------------------------------------------

AMPS-MS: PROCedure:SIGNalling:ACTion CREL
```

8 Maintenance

The CMU does not require any special maintenance. Remove any contamination on the instrument by means of a soft cloth. Make sure that the air vents are not obstructed.

Refer to the CMU Operating manual detailed maintenance, storage, and packing procedures. The CMU Operating manaul also contains a list of support and service centers.

Refer to the CMU Service manual for information on troubleshooting, repair, and calibration.

9 Error Codes

Table 9-1 lists the error codes and associated messages that may occur when you are using the remote control commands.

Table 9-1 Error Codes

Error Code	Message
0	No error
-100	Command error
-101	Invalid character
-102	Syntax error
-103	Invalid separator
-104	Data type error
-105	GET not allowed
-108	Parameter not allowed
-109	Missing parameter
-111	Header separator error
-112	Program mnemonic too long
-113	Undefined header
-113	Undefined header
-114	Header suffix out of range
-120	Numeric data error
-121	Invalid character in number
-123	Exponent too large
-124	Too many digits
-128	Numeric data not allowed
-131	Invalid suffix
-134	Suffix too long
-138	Suffix not allowed
-141	Invalid character data
-144	Character data too long
-148	Character data not allowed
-151	Invalid string data
-158	String data not allowed
-161	Invalid block data
-168	Block data not allowed
-171	Invalid expression
-178	Expression data not allowed
-180	Macro error
-200	Execution error

-211	Trigger ignored
-221	Setting conflict
-222	Data out of range
-223	Too much data
-224	Illegal parameter value
-230	Data corrupt or stale
-240	Hardware error
-241	Hardware missing
-250	Mass storage error
-251	Missing mass storage
-252	Missing media
-253	Corrupt media
-254	Media full
-255	Directory full
-256	File name not found
-257	File name error
-258	Media protected
-300	Device–specific error
-310	System error
-311	Memory error
-313	Calibration memory lost
-314	Save/recall memory lost
-315	Configuration memory lost
-330	Self test failed
-350	Queue overflow
-360	Communication error
-361	Parity error in program message
-362	Framing error in program message
-363	Input buffer overrun
-400	Query error
-410	Query INTERRUPTED
-420	Query UNTERMINATED
-430	Query DEADLOCKED
-440	Query UNTERMINATED after indefinite response

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